5-3810-287-15

TM 5-3810-287-15

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT AND
GENERAL SUPPORT, AND DEPOT
MAINTENANCE MANUAL

CRANE-SHOVEL, CRAWLER MOUNTED:
DIESEL ENGINE DRIVEN, 12-1/2 TON CAPACITY,
RATED, W/3/4 CU YD
(THEW-LORAIN MODEL L-36M)
FSN 3810-937-3939

This copy is a reprint which includes current pages from Changes 1 through 3.

HEADQUARTERS, DEPARTMENT OF THE ARMY

SEPTEMBER 1967

D101.11:

READEX FICHE best copy available

Reproduced from poor document.

SAFETY PRECAUTIONS

BEFORE OPERATION

Do not operate the engine in an enclosed area unless the exhaust is piped to an open area. The exhaust contains carbon monoxide, colorless, odorless, deadly poisonous gas.

Do not smoke or use open flame in the vicinity when servicing the batteries. Batteries generate hydrogen, a highly explosive gas.

When filling the fuel tank, always maintain metal-to-metal contact between filling apparatus and fuel tank to prevent a spark from being caused by static electricity.

DURING OPERATION

Do not fill fuel tank while engine is running.

Do not attempt to make adjustments, repairs or service the machine while engine is running. Being caught in the machinery could cause serious injury or death.

When working near electrical lines, keep boom at least six feet from wires. Contact wit high voltage lines could cause severe injury or death.

When making heavy lifts, check capacity chart. Overloading the machine could cause boom or cable failure and possible injury to the operator or ground personnel.

AFTER OPERATION

Exercise caution when removing radiator cap while engine is hot. Quick removal will allow hot engine coolant to escape and may result in serious injury to personnel.

Do not leave machine with a load suspended. Cooling of the brakes and drums could result in the load falling and possible injury to personnel.

When filling the fuel tank, always maintain metal-to-metal contact between filling apparatus and fuel tank to prevent spark being caused by static electricity.

CHANGE No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *23 April 1968*

Operator, Organizational, Direct and General Support, and Depot Maintenance Manual

CRANE-SHOVEL, CRAWLER MOUNTED: DIESEL ENGINE DRIVEN, 12½ TON CAPACITY, RATED, W/¾ CU YD (THEW-LORAIN MODEL L-36M) FSN 3810-937-3939

TM 5-3810-287-15, 29 September 1967, is changed as follows:

Inside front cover. During operation, after last line add:

When traveling the crane on a slope (grade) make certain the locking powl lever is moved to the set position before attempting to change over from travel to swing. Do not release the locking powl lever, from set position, until the change over from swing to travel has been accomplished. Make certain locking powl is completely disengaged prior to travel. A slight movement of the crane, back and forth, may be necessary to completely disengage locking powl.

Page 1-1. Paragraph 1-1*d* is superseded as follows:

d. Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to the Commanding General, U.S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Boulevard, St. Louis, Mo., 63120.

Page 2-17. Warning is added after paragraph 2-13.

WARNING: **When traveling the crane on a slope (grade) make certain the locking powl lever is moved to the set position before attempting to change over from travel to swing. Do not release the locking powl lever, from set position, until the change over from swing to travel has been accomplished. Make certain locking powl is completely disengaged prior to travel. A slight movement of the crane, back and forth, may be necessary to completely disengage locking powl.**

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:

To be distributed in accordance with DA Form 12-25, Section II, organizational maintenance requirements for Cranes-Shovels, Crawlers, 7-ton.

Changes in Force: C 1 and C 2

TM 5-3810-287-15
C 2

CHANGE No. 2

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *2 January 1970*

Operator, Organizational, Direct and General Support, and Depot Maintenance Manual

CRANE-SHOVEL, CRAWLER MOUNTED; DIESEL ENGINE DRIVEN; 12/1/2 TON CAPACITY RATED; W/3/4 CU. YD. (THEW-LORAIN MODEL I-36M)

FSN 3810-937-3939

TM 5-3810-287-15, 29 September 1967, is changed as follows:

Inside front cover: DURING OPERATION, last paragraph, change second sentence to read as follows:

Do not release the locking pawl lever (from set position) until the change-over from travel to swing has been accomplished.

Page 1-1. Section 1. General is superseded as follows:

1-1. Scope

a. These instructions are published for use by personnel to whom the Lorain, Model L-36M Crane-Shovel is issued. Chapters 1 through 3 provide information on operation, preventive maintenance services, and organizational maintenance of equipment, accessories, components, and attachments. Chapter 4 provides information for direct and general support maintenance. Also included are descriptions of main units and their functions in relationship with other components.

b. Numbers in parenthesis following nomenclature callouts on illustration indicates quantity; numbers preceding callouts indicate preferred maintenance sequence.

1-2. Forms and Records

a. Maintenance forms, records and reports which are to be used by personnel at all maintenance levels are listed in and prescribed by TM 38-750.

b. Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028, Recommended Changes to Publication, and forwarded direct to Commanding General, U.S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Boulevard, St. Louis, Mo. 63120.

Page 2-22, paragraph 2-21*a*. Add caution note after subparagraph (2):

CAUTION: Raise boom slightly and make sure the boom lock pawl is disengaged before lowering boom. Failure to disengage boom safety lock will result in serious damage to machine.

Page 3-4, line 16. Change OHA-Hydraulic Fluid, Petroleum to HBA-Hydraulic Brake Fluid.

Page 3-30. Figure 3-6(2), item 5 is rescinded.

Page 3-31. Figure 3-6(3), change item number as follows:

Change items 6 to 5; 7 to 6; 8 to 7; and 9 to 8.

Page 11-7. Figure 11-4(1) Key, items 1 thru 14 are superseded by key, items 1 thru 25, figure 11-4(2), page 11-8.

Page 11-8. Figure 11-4(2) Key, items 1 thru 25 are superseded by key, items 1 thru 14, figure 11-4(1), page 11-7.

Page B-1. Appendix B, Section I and II are superseded as follows:

Page B-5. Figure B-1(1) is rescinded.

Page B-6. Figure B-1(2) is rescinded.

Page B-7. Add item 10 to Section III.

APPENDIX B

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

B-1. Scope

This appendix lists items which accompany the Crane-Shovel or are required for installation, operation, or operator's maintenance.

B-2. General

This Basic Issue Items List is divided into the following sections:

a. Basic Issue Items — Section II. A list of items which accompany the Crane-Shovel and are required by the operator/crew for installation, operation, or maintenance.

b. Maintenance and Operating Supplies — Section III. A listing of maintenance and operating supplies required for initial operation.

B-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

a. Source, Maintenance, and Recoverability Codes (SMR).

(1) Source code, indicates the source for the listed item. Source codes are:

Code	*Explanation*
P....	Repair parts which are stocked in or supplied from the GSA/DSA or Army supply system and authorized for use at indicated maintenance categories.
P2..	Repair parts which are procured and stocked for insurance purposes because the combat or military essentiality of the end item dictates that a minimum quantity be available in the supply system.
M...	Repair parts which are not procured or stocked, but are to be manufactured in indicated maintenance levels.
A....	Assemblies which are not procured or stocked as such, but are made up of two or more units. Such component units carry individual stock numbers and descriptions, are procured and stocked separately and can be assembled to form the required assembly at indicated maintenance categories.
X....	Parts and assemblies which are not procured or stocked and the mortality of which normally is below that of the applicable end item or component. The failure of such part or assembly should result in retirement of the end item from the supply system.
X1..	Repair parts which are not procured or stocked. The requirement for such items will be filled by use of the next higher assembly or component.
X2..	Repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain them through cannibalization. Where such repair parts are not obtainable through cannibalization, requirements will be requisitioned, with accompanying justification, through normal supply channels.
G....	Major assemblies that are procured with PEMA funds for initial issue only as exchange assemblies at DSU and GSU level. These assemblies will not be stocked above GS and DS level or returned to depot supply level.

(2) Maintenance code, indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is:

Code	*Explanation*
C...	Operator/crew

(3) Recoverability code, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code	*Explanation*
R...	Repair parts (assemblies and components) which are considered economically repairable at direct and general support maintenance levels. When the maintenance capability to repair these items does not exist, they are normally disposed of at the GS level. When supply considerations dictate, some of these repair parts may be listed for automatic return to supply for depot level repair as set forth in AR 710-50. When so listed, they will be replaced by supply on an exchange basis.
S....	Repair parts and assemblies which are economically reparable at DSU and GSU activities and which normally are furnished by supply on an exchange basis. When items are determined by a GSU to be uneconomically reparable they will be evacuated to a depot for evaluation and analysis before final disposition.
T....	High dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts normally are repaired or overhauled at depot maintenance activities.
U....	Repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, or high dollar value reusable casings or castings.

b. Federal Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the Federal item name and any additional description of the item required. The abbreviation "w/e", when used as a part of the nomenclature, indicates the Federal stock number, included all armament, equipment, accessories, and repair parts issued with the item. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parenthesis. Repair parts quantities included in kits, sets, and assemblies are shown in front of the repair part name.

d. Unit of Measure (U/M). A 2 character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Incorporated In Unit. This column indicates the quantity of the item used in the assembly group. A "V" appearing in this column in lieu of a quantity indicates that a definite quantity cannot be indicated (e.g., shims, spacers, etc.).

f. Quantity Furnished With Equipment. This column indicates the quantity of an item furnished with the equipment.

g. Illustration. This column is divided as follows:

(1) *Figure number.* Indicates the figure number of the illustration in which the item is shown.

(2) *Item number.* Indicates the callout number used to reference the item in the illustration.

B-4. Explanation of Columns in the Tabular List of Maintenance and Operating Supplies — Section III.

a. Component Application. This column identifies the component application of each maintenance or operating supply item.

b. Federal Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the item name and brief description.

d. Quantity Required for Initial Operation. This column indicates the quantity of each maintenance or operating supply item required for initial operation of the equipment.

e. Quantity Required for 8 Hours Operation. This column indicates the estimated quantities required for an average 8 hours of operation.

f. Notes. This column indicates informative notes keyed to data appearing in a preceding column.

Page C-1. Appendix C is superseded as follows:

Section II. BASIC ISSUE ITEMS

(1) SMR Code	(2) Federal stock number	(3) Description Ref No. & mfr code	Usable on code	(4) Unit of meas	(5) Qty inc in unit	(6) Qty furn with equip	(7) Illustration (a) Fig No.	(b) Item No.
		ARMY TECHNICAL MANUAL TM 5-3810-287-15		EA	1	1		
		ARMY LUBRICATION MANUAL LO 5-3810-287-15		EA	1	1		
PC	7510-889-3494	BINDER, LOOSELEAF		EA	1	1		
PC	7520-559-9618	CASE, MAINTENANCE AND OPERATION MANUALS		EA	1	1		
PC	2590-505-6736	CASE, RIFLE		EA	1	1		
PC	4210-889-2221	EXTINGUISHER, FIRE, 2-3/4 LB MIL-E-52031		EA	1	1		
PC		ROD, ANTI-ROTATION D82037 (59690)		EA	1	2		
PC		WRENCH, SPECIAL CLUTCH BRK FRICTION D6383 (59690)		EA	1	1		
		WRENCH, SPECIAL TRACK ADJUSTING E2128 (59690)		EA	1	1		

Section III. MAINTENANCE AND OPERATING SUPPLIES

(1) Item	(2) Component Application	(3) Federal Stock Number	(4) DESCRIPTION	(5) Quantity Required F/Initial Operation	(6) Quantity Required F/8 Hrs Operation	(7) NOTES
10	HYDRAULIC CONTROLS	9150-252-6375	HYDRAULIC BRAKE FLUID 1 GAL. AS FOLLOWS: HBA (2)	(10)		(10) 1 PINT

Page C-1. Appendix C is superseded as follows:

APPENDIX C

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

C-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

C-2. Explanation of Columns in Section II.

a. Group Number. Column 1. The assembly group is a numerical group assigned to each assembly in a top down breakdown sequence. The appicable assembly groups are listed on the MAC in disassembly sequence beginning with the first assembly removed in a top down disassembly sequence.

b. Assembly Group. Column 2. This column contains a brief description of the components of each assembly group.

c. Maintenance Functions. Column 3. This column lists the various maintenance functions (A through K) and indicates the lowest maintenance category authorized to perform these functions. The symbol designations for the various maintenance categories are as follows:

C — Operator or crew
O — Organizational maintenance
F — Direct support maintenance
H — General support maintenance
D — Depot maintenance

The maintenance functions are defined as follows:

A — INSPECT. To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

B — TEST. To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

C — SERVICE. To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents, and air. If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed.

D — ADJUST. To rectify to the extent necessary to bring into proper operating range.

E — ALIGN. To adjust specified variable elements of an item to bring to optimum performance.

F — CALIBRATE. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparision of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

G — INSTALL. To set up for use in an operational invironment such as an emplacement, site, or vehicle.

H — REPLACE. To replace unserviceable items with serviceable like items.

I — REPAIR. Those maintenance operations necessary to restore an item to serviceable condition through correction of material damage or a specific failure. Repair may be accomplished at each category of maintenance.

J — OVERHAUL. Normally, the highest degree of maintenance performed by the Army in order to minimize time work in process is consistent with quality and economy of operation. It consists of that maintenance necessary to restore an item to completely serviceable conditions as prescribed by maintenance standards in technical publications for each item of equipment. Overhaul normally does not return an item to like new, zero mileage, or zero hour condition.

K — REBULD. The highest degree of materiel maintenance. It consists of restoring equipment as nearly as possible to new condition in accordance with original manufacturing standards. Rebuild is performed only when required by operational considerations or other paramount factors and then only at the depot maintenance category. Rebuild reduces to zero the hours or miles the equipment, or component therof, has been in use.

d. Tools and Equipment. Column 4. This column is provided for referencing by code the special tools and test equipment, (Section III) required to perform the maintenance functions (Section II).

e. Remarks. Column 5. This column is provided for referencing by code the remarks (Section IV) pertinent to the maintenance functions.

C-3. Explanation of Columns in Section III.

a. Reference Code. This column consists of a number and a letter separated by a dash. The number references the T&TE requirements column on the MAC. The letter represents the specific maintenance function the item is to be used with. The letter is representative of columns A through K on the MAC.

b. Maintenance Category. This column shows the lowest level of Maintenance authorized to use the special tool or test equipment.

c. Nomenclature. This column lists the name or identification of the tool or test equipment.

d. Tool Number. This column lists the manufacturer's code and part number, or Federal Stock Number or tools and test equipment.

C-4. Explanation of Columns in Section IV.

a. Reference Code. This column consists of two letters separated by a dash, both of which are references to Section II. The first letter references column 5 and the second letter references a maintenance function, column 3, A through K.

b. Remarks. This column lists information pertinent to the maintenance function being performed, as indicated on the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART

(1)	(2)	(3)											(4)	(5)
		Maintenance functions												
		A	B	C	D	E	F	G	H	I	J	K		
Group no.	Functional group	Inspect	Test	Service	Adjust	Aline	Calibrate	Install	Replace	Repair	Overhaul	Rebuild	Tools and equipment	Remarks
01	ENGINE													
	Engine Assembly	C	F	C	—	—	—	—	F	F	H	D	—	A-B
	Crankcase, Blk, Cyl Head;													
	Block, Cylinder; Crankcase	—	—	—	—	—	—	—	H	H				
	Head, Cylinder	—	—	—	—	—	—	—	F	F				
	Crankshaft:													
	Crankshaft Assembly; Bearings; Seals	—	—	—	—	—	—	—	H	—	—	D	—	B-K
	Damper and Pulley	—	—	—	—	—	—	—	F					
	Flywheel Assembly	—	—	—	—	—	—	—	F	F				
	Pistons, Connecting Rods	—	—	—	—	—	—	—	H	H				
	Valves, Camshafts and Timing Systems:													
	Arm Assembly, Rocker	—	—	—	O	—	—	—	F	F				
	Bushings, Camshaft, Gears	—	—	—	—	—	—	—	H					
	Cover, Valve	—	—	—	—	—	—	—	O					
	Push Rods, Springs, Guides, Locks:													
	Valves and Seats	—	—	—	—	—	—	—	F					
	Engine Lubrication System:													
	Cooler, Oil	—	—	—	—	—	—	—	O	O				
	Filter Assembly, Oil	—	—	C	—	—	—	—	O	O				
	Lines; Pan, Oil	—	—	—	—	—	—	—	F					
	Pump, Oil	—	—	—	—	—	—	—	F	F				
	Valve, By-Pass	—	—	—	—	—	—	—	F					
	Manifolds:													
	Intake & Exhaust, Gasket	—	—	—	—	—	—	—	O					
	Accessory Driving Mechanism:	—	—	—	—	—	—	—	F					
02	CLUTCH													
	Clutch Assembly	C	—	C	O	—	—	—	F	F	F			
	Clutch Release Mechanism:													
	Bearing	—	—	—	—	—	—	—	F					
	Rods, Levers	—	—	—	O	—	—	—	O					
03	FUEL SYSTEM													
	Fuel Injector	—	D	—	O	—	—	—	O	D				
	Fuel Pump	—	—	—	—	—	—	—	O					
	Air Cleaner	—	—	C	—	—	—	—	O					
	Blower Assembly	—	—	—	—	—	—	—	F	F	H			
	Tank, Lines, Fittings:													
	Lines; Fittings; Valve, Shut-off	—	—	—	—	—	—	—	O					
	Tank, Fuel	C	—	—	—	—	—	—	O	F				
	Engine Speed Governor	—	O	—	O	—	—	—	O	F	H			
	Fuel Filters	—	—	O	—	—	—	—	O	—	—		—	C-C
	Strainers	—	—	C	—	—	—	—	O					

(1) Group no.	(2) Functional group	(3) Maintenance functions A Inspect	B Test	C Service	D Adjust	E Aline	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	(4) Tools and equipment	(5) Remarks
	Engine Starting Aids:													
	Primer Unit; Lines:													
	Fittings	—	—	—	—	—	—	—	O					
	Throttle Control	—	—	O	—	—	—	—	O					
04	EXHAUST SYSTEM													
	Muffler and Pipes	—	—	—	—	—	—	—	O					
05	COOLING SYSTEM													
	Radiator	C	O	C	—	—	—	—	O	F				
	Cap	—	—	—	—	—	—	—	O					
	Shroud	—	—	—	—	—	—	—	O					
	Water Manifold, Thermostats and Housing Gaskets:													
	Gasket	—	—	—	—	—	—	—	O					
	Water Pump	—	—	—	—	—	—	—	O	F	H			
	Fan Assembly:													
	Blade and Guard	—	—	—	—	—	—	—	O					
	Bearings	—	—	C	—	—	—	—	F					
	Shaft and Pulley	—	—	—	—	—	—	—	F					
	Bearings	—	—	C	—	—	—	—	F					
	Shaft and Pulley	—	—	—	—	—	—	—	F					
	Belt, Fan	C	—	—	O	—	—	—	O					
06	ELECTRICAL SYSTEM													
	Alternator:													
	Alternator Assembly	—	O	O	—	—	—	—	O	F	—	—	—	D-I
	Pulley	—	—	—	—	—	—	—	O					
	Belts	C	—	—	O	—	—	—	O					
	Starting Motor:													
	Motor, Starting	—	O	C	—	—	—	—	O	F	—	—	—	E-I
	Solenoid	—	O	—	—	—	—	—	O					
	Instrument or Engine Control Panel:													
	Switches; Gages; Meters	—	—	—	—	—	—	—	O					
	Lights, Panel	—	—	—	—	—	—	—	O					
	Lamps; Fuses	—	—	—	—	—	—	—	O					
	Wiring Harness	—	—	—	—	—	—	—	F	O				
	Miscellaneous Items:													
	Battery Charging Recep.	—	—	—	—	—	—	—	O					
	Lights:													
	Floodlights	—	—	—	—	—	—	—	O					
	Lamps, Floodlight	—	—	—	—	—	—	—	O					
	Sending Units & Warning Switches	—	—	—	—	—	—	—	O					
	Horn	—	—	—	—	—	—	—	O					

(1)	(2)	(3) Maintenance functions											(4)	(5)
Group no.	Functional group	A Inspect	B Test	C Service	D Adjust	E Aline	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	Tools and equipment	Remarks
	Batteries, Storage:													
	Batteries	C	O	C	—	—	—	—	O					
	Bracket, Battery; Cables	C	—	C	—	—	—	—	O					
	Chassis Wiring Harness	—	—	—	—	—	—	—	F	O				
07	TRANSMISSION													
	Transmission Assembly	C	O	O	—	—	—	—	F	F	H			
08	WHEELS AND TRACKS													
	Track Support Rollers & Brackets	C	—	C	—	—	—	—	O	O				
	Track Idlers & Brackets	C	—	C	—	—	—	—	F	F				
	Track Drive Sprockets													
	Sprockets, Bearing & Seals	—	—	—	—	—	—	—	F					
	Chain, Roller	—	—	—	O	—	—	—	O	O				
	Track Assembly	C	—	—	C	—	—	—	F	F				
09	FRAME													
	Counterweights	—	—	—	—	—	—	—	F					
10	BODY AND CAB													
	Body and Cab Assemblies:													
	Doors, Guides, Glass, Panels, Platform, Guards	C	—	—	—	—	—	—	O					
	Upholstery Seats:													
	Seat Assembly	—	—	—	C	—	—	—	O	O				
11	ACCESSORY ITEMS													
	Data Plates and Instruction Holders:													
	Data Plates	—	—	—	—	—	—	—	F					
	Caution, Instruction Plate and Instruction Holders	—	—	—	—	—	—	—	O					
12	HYDRAULIC SYSTEM													
	Hose; Tubing; Rotating Joint	—	—	—	—	—	—	—	O					
	Upperworks Center Journal Rotating Joint	O	—	—	—	—	—	—	F					
	Pump & Pump Drives	O	—	—	O	—	—	—	O	F				
	Control Valves	—	—	—	—	—	—	—	O	D				
	Hydraulic Cylinders	—	—	—	—	—	—	—	O	F				
	Liquid Tank or Reservoirs	C	—	O	—	—	—	—	O	O				
	Hydraulic Controls	—	—	—	—	—	—	—	O	F				
13	GAGES (NON-ELECTRICAL)													
	Gages, Mountings, Lines & Fittings	—	—	—	—	—	—	—	O					
	Hourmeter	—	—	—	—	—	—	—	O					
14	CRANES, SHOVELS & EARTH-MOVING EQUIPMENT COMPONENTS													
	Shovel Front Attachments	C	—	O	O	—	—	—	O	O				

Section II. MAINTENANCE ALLOCATION CHART (continued)

(1)	(2)	(3)											(4)	(5)
		Maintenance functions												
		A	B	C	D	E	F	G	H	I	J	K		
Group no.	Functional group	Inspect	Test	Service	Adjust	Aline	Calibrate	Install	Replace	Repair	Overhaul	Rebuild	Tools and equipment	Remarks
	Crane Attachments:													
	Boom Assembly; Sheaves; Hook, Block; Bridle Assy	C	—	O	—	—	—	—	O	O				
	Cables	C	—	—	—	—	—	—	O					
	Safety Boom Stop	—	—	—	—	—	—	—	O	O				
	Pulleys, Pins	—	—	—	—	—	—	—	O					
	Backhoe Attachments	C	—	O	—	—	—	—	O	O				
	Base deck:													
	Upper Structure Assembly	C	—	O	—	—	—	—	H	F	D			
	Revolving Base	C	—	O	—	—	—	—	D	F				
	Shearball Assembly	—	—	O	—	—	—	—	H	H				
	Clutches	C	—	O	O	—	—	—	H	H	H			
	Brakes	—	—	—	—	—	—	—	—	F	H			
	Shafts:													
	Chain, Drive	—	—	—	O	—	—	—	O	O				
	Sprockets, Gear Bearings, Coupling, Shaft; Shaft Assemblies	C	—	O	—	—	—	—	H	H				
	Hoists:													
	Drum, Third	O	O	O	O	—	—	—	O	O				
	Hoist Assemblies	C	—	C	—	—	—	—	F	H				
	Lagging and Drums	—	—	—	—	—	—	—	O					
	Turntable:													
	Bushing, Pivot	—	—	C	—	—	—	—	H					
	Swing Lock	—	—	C	—	—	—	—	O	O				
	Independent or Precision Boom Hoist	C	—	O	—	—	—	—	F	F				
	Machinery Mechanism Controls	C	—	O	C	—	—	—	O					
	Gantry:													
	Frame, Gantry	C	—	—	—	—	—	—	F	O				
	Bushing; Roller; Shaft	—	—	O	—	—	—	—	F					
	Sheave Assembly	—	—	O	—	—	—	—	O					
	Crawler Bed, Frame and Ring													
	Gear:													
	Rack and Track	—	—	O	—	—	—	—	H	D				
	Gear, Ring; Bearings	—	—	—	—	—	—	—	H					
	Propel & Steering Mechanism Bearings, Gears, Seals	—	—	—	—	—	—	—	H					
15	FIRE FIGHTING EQUIPMENT COMPONENTS													
	Fire Extinguisher	C	—	—	—	—	—	—	O					

Section III. SPECIAL TOOL AND SPECIAL TEST EQUIPMENT REQUIREMENTS

Reference Code	*Maintenance Category*	*Nomenclature*	*Tool Number*

NO SPECIAL TOOLS OR TEST EQUIPMENT ARE REQUIRED.

Section IV.

Reference Code	*Remarks*
A-B	TEST INCLUDES OPERATION AND COMPRESSION.
B-K	METALLIZE, GRIND AND BALANCE.
C-C	REPLACE FILTER ELEMENTS.
D-I	REPAIR INCLUDES REPAIR KIT.
E-I	REPAIR INCLUDES REPAIR KIT.

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:

To be distributed in accordance with DA Form 12-25, Sec II (qty rqr Block No. 338), Organizational maintenance requirements for Crane-Shovels, Crawlers, 12-1/2 Ton.

Change in force: C 1, C 2, and C 3

TM 5-3810-287-15
C 3

CHANGE No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *31 August 1973*

Operator's Organizational, Direct Support, General Support, and Depot Maintenance Manual

CRANE-SHOVEL, CRAWLER MOUNTED; DIESEL ENGINE DRIVEN; 12½ TON, CAPACITY RATED; ¾ CU. YD.

(THEW-LORAIN MODEL L-36M

FSN 3810-937-3939

TM 5-3810-287-15, 29 September 1967, is changed as follows:

The title is changed as shown above.

Page 1-1. Paragraph 1-2*b* is superseded as follows:

b. The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commander, US Army Troop Support Command, Attn: AMSTS-MP, 4300 Goodfellow Boulevard, St. Louis, MO 63120.

Page 2-1. Paragraph 2-3*f* is added after paragraph 2-3*e*.

f. Maintenance and operating supplies required for the initial 8 hours of operation for the crane-shovel are contained in table 2-1.1.

Table 2-1.1. Maintenance and Operating Supplies

(1) Component application	(2) Federal stock number	(3) Description	(4) Quantity required for initial operation	(5) Quantity required for 8 hrs operation	(6) Notes
CRANKCASE		OIL, LUBRICATING 5 gal drums as follows:	(1)	(3)	(1) Includes quantity of oil to fill engine oil system as follows: Crankcase, w filters 10 qt
	9150-265-9435	OE-30 (2)	(1)	(3)	
	9150-265-9428	OE-10 (2)	(1)	(3)	
	9150-242-7603	OES (2)			
TANK FUEL		FUEL OIL, DIESEL, BULK (2)			(2) See C9100-IL for additional data and requisitioning procedures.
	9140-286-5294	Regular grade (DF-2)	(4)	(5)	
	9140-286-5286	Winter grade (DF-1)	(4)	(5)	
	9140-286-5283	Arctic grade (DF-A)	(4)	(5)	
RADIATOR		WATER, Antifreeze 55 gallon drum.	(6)		(3) See LO 5-3810-287-15 for grade, application and replenishment.
	6850-893-8636	ANTIFREEZE, ETHYLENE GLYCOL	(7)		
	6850-174-1806	ANTIFREEZE, COMPOUND ARCTIC	(8)		(4) Tank capacity: 50 gal
EXPOSED GEARS		OIL LUBRICATING, EXPOSED GEAR: 5 lb pail, CW-11-B. (2)	lb.	(3)	(5) Average fuel consumption is 6 gallons per hour of continuous operation.
OIL CAN POINTS	9150-234-5199	OIL, LUBRICATING		(3)	(6) Cooling system capacity is 25 qts.
GEAR CASE		OIL, LUBRICATING GEAR: 5 gal drum as follows:			
	9150-577-5844	G090 (2)		(3)	
	9150-257-5440	GOS (2)		(3)	(7) Maximum protection is obtained at 60 percent by volume (4.8 pints of ethylene glycol per gallon of solution).
GREASE POINTS	9150-190-0905	GREASE, AUTOMOTIVE AND ARTILLERY, 5 lb can, GAA. (2)	lb.	(3)	
SHEARBALL	9150-249-0908	GREASE, BALL AND ROLLER BEARING, 35 lb pail, BR. (2)			(8) Do not dilute with water or any other substance.
HYDRAULIC SYSTEM	9150-265-9408	HYDRAULIC FLUID, PETROLEUM, 55 gal drum, OHA. (2)	(9)	(3)	(9) Reservoir capacity 10 gal
HYDRAULIC CONTROLS.	9150-252-6375	HYDRAULIC BRAKE FLUID 1 gal, HBA. (2)	(10)		(10) 1 pint

Page B-1. Appendix B is superseded as follows:

APPENDIX B

BASIC ISSUE ITEM LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED

Section 1. INTRODUCTION

1. Scope

This appendix lists basic issue items and items troop installed or authorized which accompany the crane-shovel, and are required by the crew operator for operation, installation, or operator's maintenance.

2. General

This basic issue items and items troop installed or authorized list is divided into the following sections:

a. Basic Issue Items List—Section II. Not applicable.

b. Items Troop Installed or Authorized List—Section III. A list in alphabetical sequence of items which, at the descretion of the unit commander, may accompany the end item, but are not subject to be turned in with the end item.

3. Explanation of Columns

The following provides an explanation of the columns in the tabular list of items troop installed or authorized, section III.

a. Source, Maintenance, and Recoverability Code (s) (SMR): Not applicable.

b. Federal Stock Number. This column indicates the Federal stock number assigned to the item which will be used for requisitioning purposes.

c. Description. This column indicates the Federal item name and any additional description of the item required.

d. Unit of Measure (U/M). A 2-character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based; e.g., ft, ea, pr; etc.

e. Quantity Authorized. This column indicates the quantity of the item authorized to be used with the equipment.

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) SMR code	(2) Federal stock number	(3) Description	(4) Unit of meas	(5) Qty auth
	7520-559-9618	CASE, MAINTENANCE AND OPERATION MANUAL	ea	1
	2590-505-6736	CASE, RIFLE	ea	1
	5120-116-9686	ROD, ANTIROTATION	ea	1
	4210-889-2221	EXTINGUISHER, FIRE	ea	1
	5120-116-9691	WRENCH, SPANNER, CLUTCH BRAKE	ea	1
	5120-116-9692	WRENCH, SPANNER, TRACK ADJUSTING	ea	1

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:
VERNE L. BOWERS
Major General, United States Army
The Adjutant General

TM 5-3810-287-15, C3

Distribution:

To be distributed in accordance with DA Form 12-25B (qty rqr block No. 922), Operator Requirements for Crane-Shovel, Crawler.

TECHNICAL MANUAL
No. 5-3810-287-15

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *29 September 1967*

Operator, Organizational, Direct And General Support And Depot Maintenance Manual

CRANE-SHOVEL, CRAWLER MOUNTED: DIESEL ENGINE DRIVEN, 12-1/2 TON CAPACITY, RATED, W/3/4 CU YD THEW-LORAIN MODEL L-36M FSN 3810-937-3939

		Paragraph	Page
CHAPTER 1.	INTRODUCTION		
Section I.	General	1-1, 1-2	1-1
II.	Description and tabulated data	1-3—1-5	1-1—1-6
CHAPTER 2.	INSTALLATION AND OPERATION INSTRUCTIONS		
Section I.	Service upon receipt of equipment	2-1—2-7	2-1—2-3
II.	Equipment conversion	2-8—2-12	2-12—2-14
III.	Movement to a new worksite	2-13—2-15	2-17
IV.	Controls and instruments	2-16, 2-17	2-18
V.	Operation of equipment	2-18—2-27	2-22—2-26
VI.	Operation of auxiliary material used in conjunction with the equipment	2-28	2-31
CHAPTER 3.	OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS		
Section I.	Operator and organizational maintenance tools and equipment	3-1, 3-2	3-1
II.	Lubrication	3-3, 3-4	3-1
III.	Preventive maintenance services	3-5—3-7	3-28
IV.	Operator's maintenance	3-8—3-24	3-36—3-37
V.	Troubleshooting	3-25—3-41	3-54—3-56
VI.	Radio interference suppression	3-42—3-46	3-56
VII.	Fuel System	3-47—3-55	3-57—3-62
VIII.	Cooling System	3-56—3-61	3-74—3-76
IX.	Electrical System	3-62—3-75	3-82—3-89
X.	Lubrication System	3-76—3-78	3-96—3-98
XI.	Exhaust system	3-79—3-80	3-101
XII.	Operating control levers, pedals and linkage	3-81—3-82	3-106
XIII.	Body, cab, hood, and hull assemblies	3-83—3-86	3-108—3-111
XIV.	Body chassis or hull accessory items	3-87, 3-88	3-114
XV.	Hydraulic system	3-89—3-97	3-116—3-121
XVI.	Clutches	3-98—3-100	3-128—3-132
XVII.	Crane boom sheaves, bridle assembly, hook block and safety boom stops	3-101, 3-102	3-133, 3-134
XVIII.	Drive chains, guards and shields	3-103, 3-104	3-135
XIX.	Gantry frame assembly	3-105	3-140
XX.	Crawler assembly	3-106, 3-109	3-141, 3-144
XXI.	Chain case and engine drive chain assemblies	3-108, 3-109	3-142, 3-144
CHAPTER 4.	INTRODUCTION		
Section I.	General	4-1, 4-2	4-1
II.	Description and tabulated data	4-3, 4-4	4-1
CHAPTER 5.	GENERAL MAINTENANCE INSTRUCTIONS		
Section I.	Special tools and equipment	5-1, 5-2	5-1
II.	Troubleshooting	5-3—5-19	5-1—5-3

Paragraph Page
Section III. Radio interference suppression ---- 5–20—5–22 5–3
IV. Removal and installation of major components ---- 5–23—5–35 5–3—5–14

CHAPTER 6. ENGINE REPAIR INSTRUCTIONS

Section I. Engine accessories ---- 6–1—6–11 6–1—6–13
II. Engine components ---- 6–12—6–29 6–25—6–47

CHAPTER 7. SUPERSTRUCTURE REPAIR INSTRUCTIONS

Section I. Hoist shaft assembly ---- 7–1—7–3 7–1
II. Power boom lowering assembly ---- 7–4, 7–5 7–6
III. Power Load lowering assembly ---- 7–6—7–8 7–8
IV. Clutch shaft assembly ---- 7–9—7–12 7–12—7–16
V. Vertical reversing shaft assembly ---- 7–13, 7–14 7–17
VI. Bevel gear housing ---- 7–15, 7–16 7–18, 7–19
VII. Swing and travel jaw clutch shift mechanism ---- 7–17, 7–18 7–22
VIII. Vertical swing shaft and deck gear assemblies ---- 7–19, 7–20 7–25
IX. Gantry shaft assembly ---- 7–21, 7–22 7–28
X. Third drum assembly ---- 7–23, 7–24 7–31
XI. Shearball assembly ---- 7–25, 7–26 7–34
XII. Turntable bed ---- 7–27, 7–28 7–37
XIII. Cab assembly ---- 7–29, 7–30 7–38
XIV. Counterweight ---- 7–31, 7–32 7–42

CHAPTER 8. CRAWLER ASSEMBLY REPAIR INSTRUCTIONS

Section I. Crawler belts and side frames ---- 8–1—8–6 8–1—8–3
II. Crawler assembly hydraulic components ---- 8–7—8–10 8–9
III. Vertical travel shaft assembly ---- 8–12, 8–13 8–17
IV. Horizontal travel shaft assembly ---- 8–14—8–16 8–19
V. Crawler frame ---- 8–17, 8–18 8–21

CHAPTER 9. CRANE BOOM REPAIR INSTRUCTIONS

Section I. Boom point assembly ---- 9–1, 9–2 9–1
II. Boom base assembly ---- 9–3, 9–4 9–4
III. Boom harness assembly ---- 9–5, 9–6 9–6
IV. Hook block assembly ---- 9–7, 9–8 9–7

CHAPTER 10. BACKHOE ATTACHMENT REPAIR INSTRUCTIONS

Section I. Bucket assembly ---- 10–1, 10–2 10–1
II. Backhoe handle and pitch brace assembly ---- 10–3, 10–4 10–3
III. Backhoe boom assembly ---- 10–5, 10–6 10–5
IV. Backhoe mast assembly ---- 10–7, 10–8 10–7

CHAPTER 11. SHOVEL FRONT ATTACHMENT REPAIR INSTRUCTIONS

Section I. Dipper assembly ---- 11–1, 11–2 11–1
II. Dipper handle assembly ---- 11–3, 11–4 11–3
III. Shipper shaft assembly ---- 11–5, 11–6 11–6
IV. Shovel boom assembly ---- 11–7, 11–8 11–7
V. Dipper trip assembly ---- 11–9, 11–10 11–9
APPENDIX A. REFERENCES ---- A–1
B. BASIC ISSUE ITEMS LIST AND MAINTENANCE AND OPERATING SUPPLIES ---- B–1
C. MAINTENANCE ALLOCATION CHART ---- C–1
INDEX ---- I–1

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope

a. These instructions are published for use by personnel to whom the Lorain, Model L-36M Crane-Shovel is issued. Chapters 1 through 3 provide information on operation, preventive maintenance services, and organizational maintenance of equipment, accessories, components, and attachments. Chapter 4 provides information for direct and general support and depot maintenance. Also included are descriptions of main units and their functions in relationship to other components.

b. Appendix A contains a list of publications applicable to this manual. Appendix B contains the list of basic issue items authorized the operator of this equipment and the list of maintenance and operating supplies required for initial operation. Appendix C contains the maintenance allocation chart.

c. Numbers in parenthesis following nomenclature callouts on illustrations indicate quantity; numbers preceding nomenclature callouts indicate preferred maintenance sequence.

d. DA Form 2028 (Recommended changes to DA Publication) will be used for reporting discrepancies and recommendations for improving this equipment publication. This form will be completed by the individual using the manual and forwarded direct to Commanding General, U.S. Army Mobility Equipment Command, ATTN: AMSME-MP, 4300 Goodfellow Blvd., St. Louis, Mo. 63120.

e. Report all equipment improvement recommendations as prescribed by TM 38-750.

1-2. Record and Report Forms

a. DA Form 2258 (Depreservation Guide for Vehicles and Equipment).

b. For other record and report forms applicable to the operator, crew, and organizational maintenance, refer to TM 38-750.

Note. Applicable forms, excluding Standard Form 46 (United States Government Motor Vehicle Operator's identification card) which is carried by the operator, shall be kept in a canvas bag mounted on the equipment.

Section II. DESCRIPTION AND TABULATED DATA

1-3. Description

The Lorain Crane-Shovel Model L-36M (figs. 1-1 through 1-6) is a crawler mounted 3/4 cubic yard, 12-1/2 ton capacity machine. It consists of a crawler frame assembly, a shearball connection, a turntable bed, and a front end attachment. It can be equipped as a crane for handling material; as a shovel for ground level excavation; or as a backhoe for below ground level excavation. By adding a clamshell bucket and tagline to the crane boom, the machine can be used for below ground level excavation, charging bins, or stockpile work. By adding a dragline bucket and fairlead, the machine can be used for the excavation of drainage ditches, below ground level excavation, loading hauling units, and many other applications of moving and handling materials.

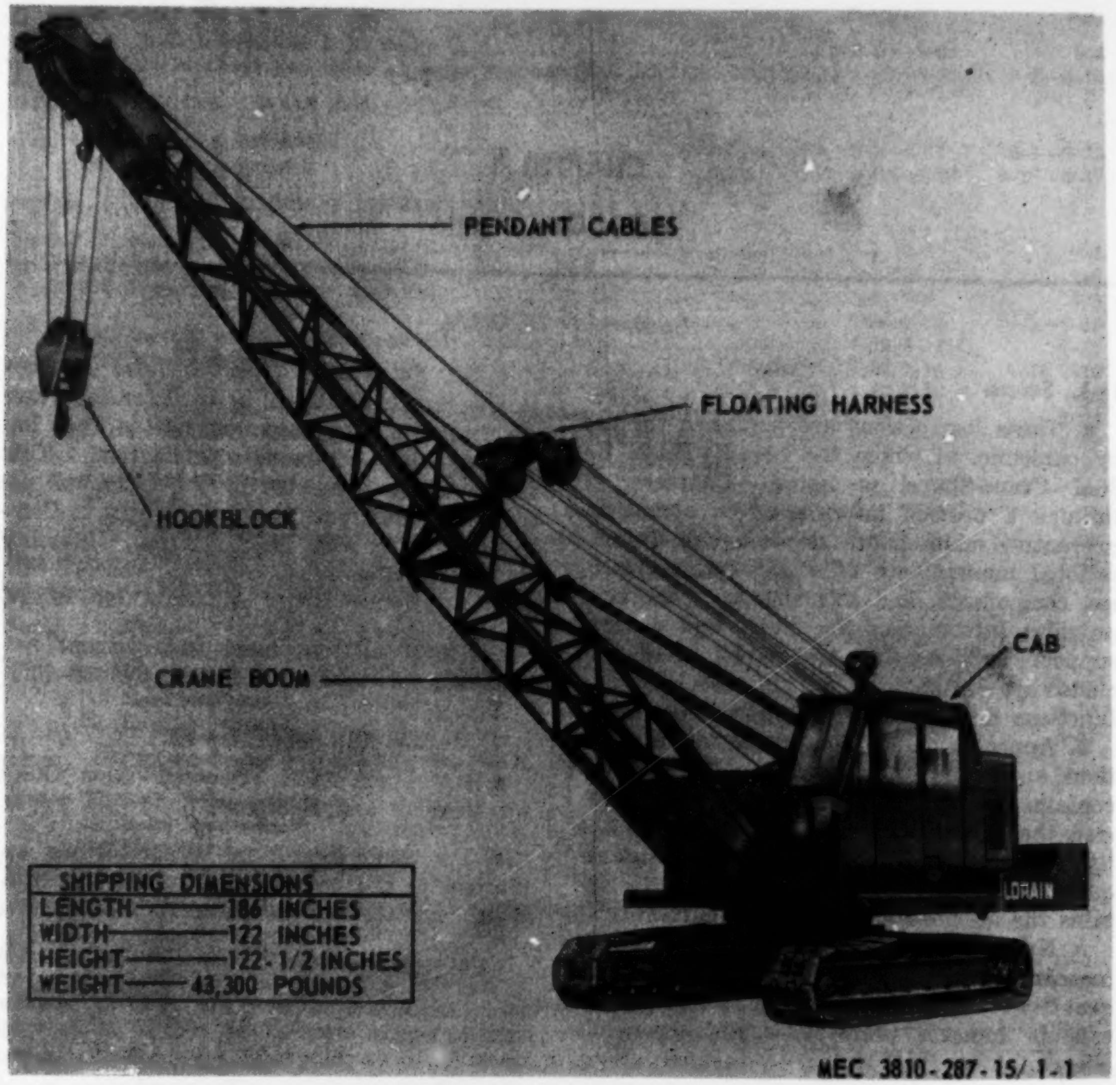

PENDANT CABLES
FLOATING HARNESS
HOOKBLOCK
CAB
CRANE BOOM
SHIPPING DIMENSIONS
LENGTH——186 INCHES
WIDTH——122 INCHES
HEIGHT——122-1/2 INCHES
WEIGHT——43,300 POUNDS
LORAIN
MEC 3810-287-15/1-1

Figure 1-1. Lorain crane, left-front, three-quarter view.

1-4. Identification and Tabulated Data

a. Identification. The Thew-Lorain crane-shovel model L-36M has major identification plates. The information contained on the plates is listed below.

(1) *Engine plate.*

Option	
Model	3055C
Unit number	3A-67013
Max. r.p.m.-no load	1640
Rated h.p.	106 at 2100
Cont. h.p.	75 at 1800

Equipment	Type
Flywheel housing	97
Oil dist.	61
Vent system	1
Crankshaft pulley belt	223
Air inlet housing	169
Engine mts.	3
Muffler and Connector	258
Flywheel	487
Dipstick	310
Crankshaft cvr.	10
Water conn.	48
Alarm	221

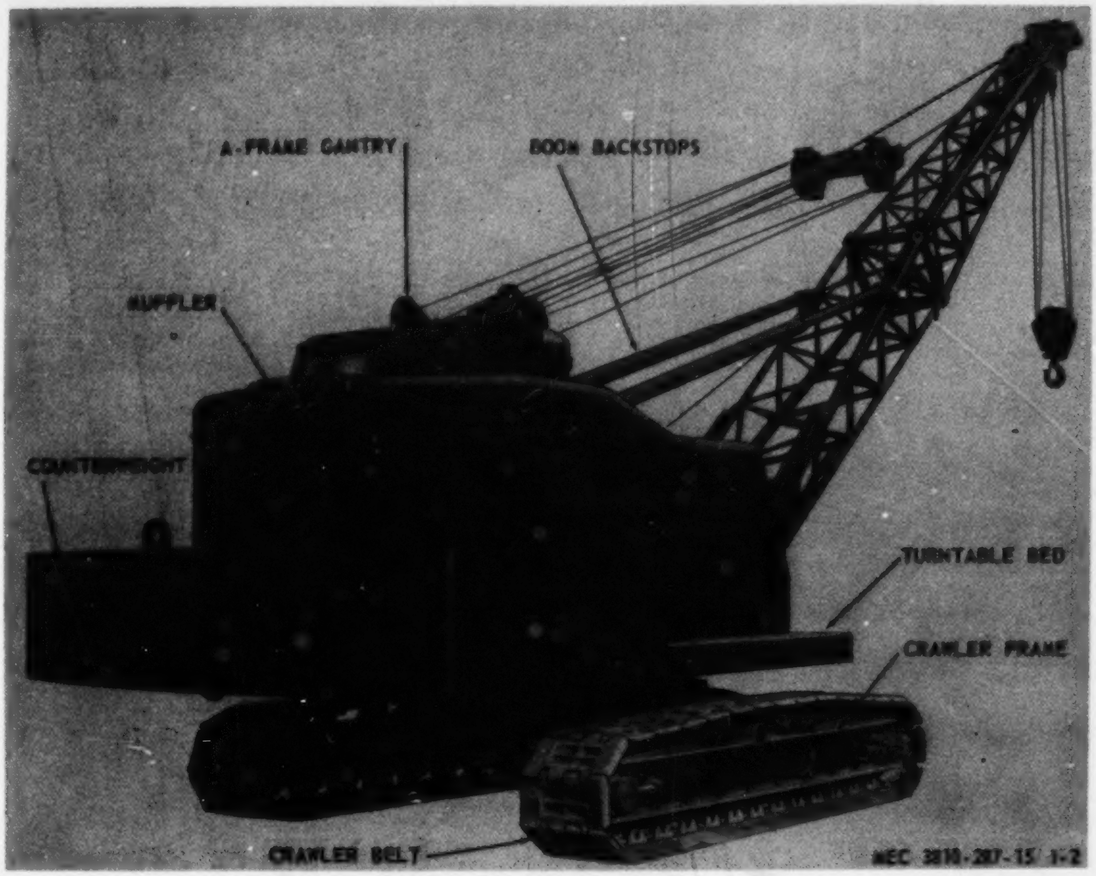

A-FRAME GANTRY
BOOM BACKSTOPS
MUFFLER
COUNTERWEIGHT
TURNTABLE BED
CRAWLER FRAME
CRAWLER BELT
MEC 3810-287-15 1-2

Figure 1-2. Lorain crane, right-rear, three-quarter view.

Starter	
Instrs.	**33**
Equipment	**Type**
Oil pan	**1**
Oil cooler	**91**
Fan	**220**
Water bypass tube	**16**
Throttle cont.	**807**
Battery chrg. gen.	
Tachometer drive	**26**
Equipment	**Type**
Oil pump	**23**
Oil filter	**51**
Crankshaft, pulley	
Injector	**12**
Mech. governor	**89**
Starting aid	**45**

b. Tabulated Data.

(1) *Lorain crane-shovel.*

Manufacturer	Thew-Lorain Division, Koehring Company
Model	L-36M
Type	12 1/2 ton, 3/4 cubic yard crawler crane
Serial numbers	33600 through 33669

(2) *Engine.*

Manufacturer	Detroit Diesel Engine Corp.
Type	Diesel
Model	3055C
Bore	4 1/4 in.
Stroke	5 in.
Fuel	Diesel
Piston displacement	213 cu. in.
Specification number	
Compression ratio	17 to 1
Number of cylinders	3

(3) *Transmission.*

Manufacturer	Rockwell Standard Corp.
Model	T-99-D-1
Ratio	1.96

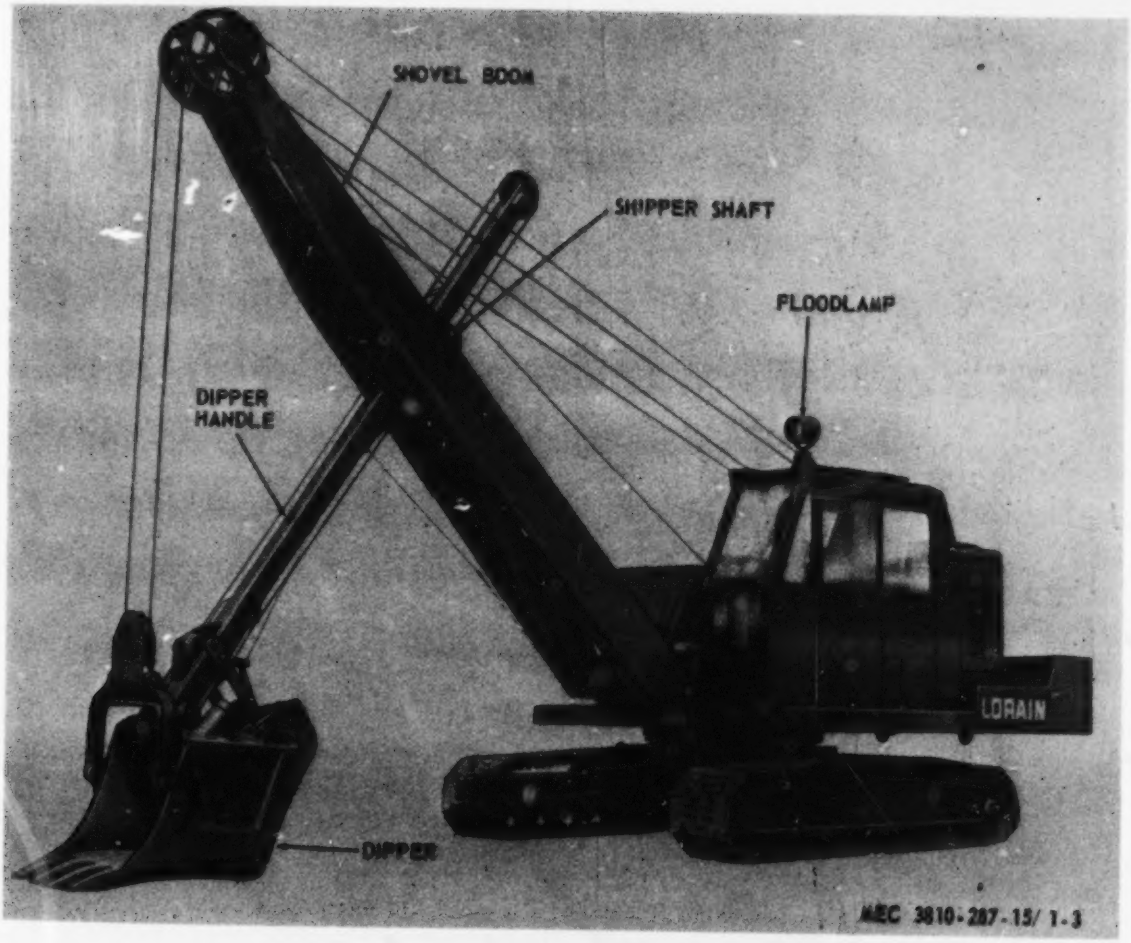

SHOVEL BOOM
SHIPPER SHAFT
FLOODLAMP
DIPPER HANDLE
DIPPER
LORAIN
MEC 3810-287-15/ 1-3

Figure 1-3. Lorain shovel, left-front, three-quarter view.

(4) *Engine accessories.*

(*a*) *Alternator.*

Manufacturer	Leece-Neville
Model	3002AC
Volts	27-31
Amperes	60
Watts	1800

(*b*) *Reverse polarity relay.*

Manufacturer	Leece-Neville
Model	47593
Volts	24

(*c*) *Batteries.*

Manufacturer	Willard Storage Battery Co.
Type	US 6TN
Volts	12
Amperage	100 ampere hours

(*d*) *Air cleaner.*

Manufacturer	Donaldson
Model	FWA10-0017
Type	Dry
Element	P10-1234

(*e*) *Fuel transfer pump.*

Manufacturer	Detroit Diesel Div., General Motors Corp.
Type	Gear, Part No. 5184532

(*f*) *Fuel strainer.*

Manufacturer	AC
Model	T-60
Element	AC sock type T-553

(*g*) *Fuel filter.*

Manufacturer	AC
Model	T-58
Element	AC type TP-509

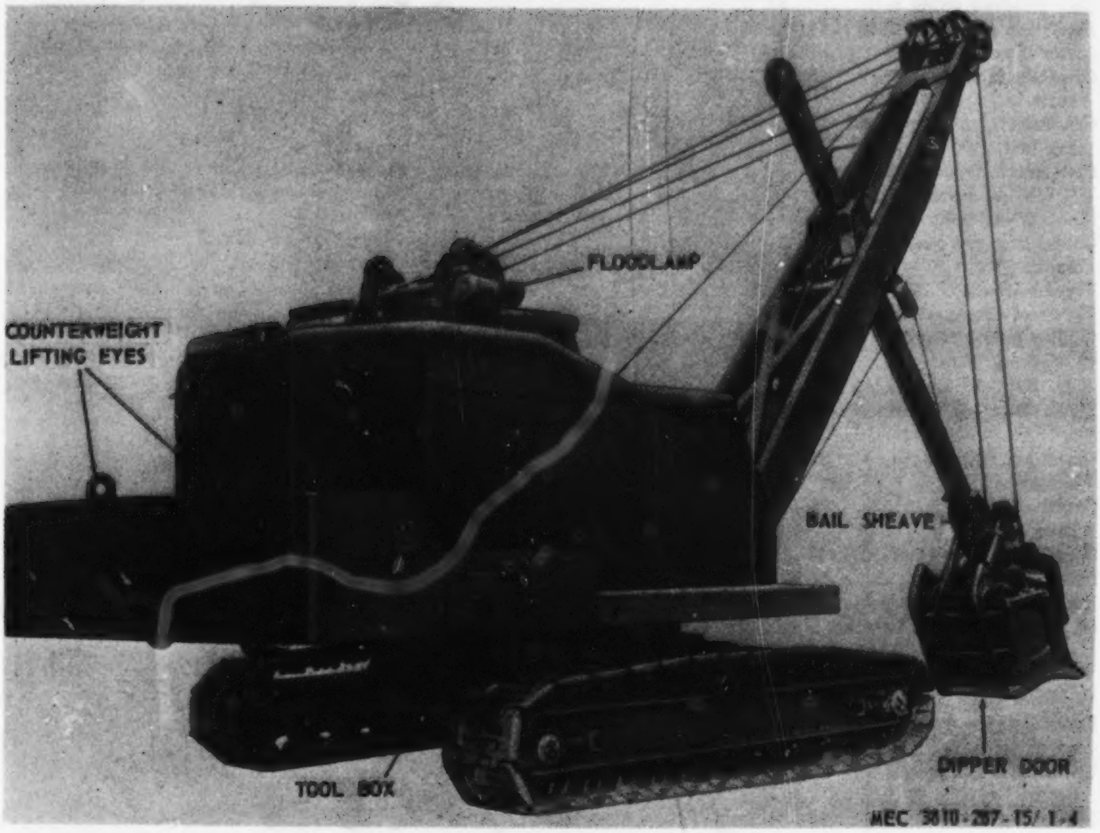


Figure 1-4. Lorain shovel, right-rear, three-quarter view.

(h) *Radiator.*

Manufacturer	Perfex Corporation
Model or part number	R-7623B

(i) *Injectors.*

Manufacturer	Detroit Diesel Div. General Motors Corp.
Type	HV7

(j) *Oil filters.*

Manufacturer	AC
Model	PM-13
Element	AC type PF-132

(k) *Hydraulic pump.*

Manufacturer	Hydreco Division New York Air Brake Co.
Model	1506 C3C1

(l) *Governor.*

Manufacturer	Detroit Diesel Division General Motors Corporation
Type	SW-VS
Drive ratio	2 to 1
Idle range	500—900

(m) *Starter.*

Manufacturer	Delco-Remy
Model	1113847
Volts	24

(n) *Control valve.*

Manufacturer	Hydreco Division New York Air Brake Co.
Model	V13 FF SF 318

(5) *Capacities.*

Fuel tank	50 gal. (gallons)
Engine crankcase	13 qts. (quarts)
Cooling system	6.5 gals.
Hydraulic reservoir	10 gals.

(6) *Nut and bolt torque data.*

Cylinder head mounting nuts.	175—185 ft. lbs. (foot-pounds)

Cam follower guide bolts	12—15 ft. lb.
Fuel pipe connector nuts	12—15 ft. lb.
Lifter bracket bolts	55—60 ft. lb.
Crankshaft main bearing bolts.	180—190 ft. lb.
Crankshaft pulley mounting bolt.	290—310 ft. lb.
Crankshaft front cover	
3/8"-24 bolts	25—30 ft. lb.
1/2"-13 bolts	80—90 ft. lb.
Connecting rod bearing bolts.	60—70 lb. ft.
Flywheel bolts	150—160 ft. lb.
Flywheel housing bolts	
Idler gear hub self-locking nuts	
3/8"-16	40—45 ft. lb.
All other - 3/8"-16	24—30 ft. lb.
1/2"-13	90—100 ft. lb.
Camshaft rear bearing bolts.	35—40 ft. lb.
Camshaft front bearing bolts.	35—40 ft. lb.
Camshaft lock screws	15—20 ft. lb.
Balance weight nut	300—325 ft. lb.
Rocker arm brackets bolts	90—100 ft. lb.
Idler gear, hub and bearing assembly	
Hub	80—90 ft. lb.
Idler gear	80—90 ft. lb.
Front balance weight cover bolts.	25—30 ft. lb.
Crankshaft timing gear bolts.	35—39 ft. lb.
Blower bolts	55—60 ft. lb.
Blower air inlet housing	16—20 ft. lb.
Pressure relief valve spring.	48—53 lbs.
Oil pump bolts	35—39 ft. lb.
Lubricating oil filter by-pass valve spring	10.5—11.5 lbs.
Fresh water pump bolts	15—19 ft. lb.
Fan	
Hub	83—93 ft. lb
Manifold nuts	30—35 ft. lb.
Brass exhaust manifold flange nuts.	20—25 ft. lb.
Injector filter caps	65—75 ft. lb.
Injector clamp bolt	20—25 ft. lb.

(7) *Adjustment data.*

(*a*) Engine valves	
Hot	.009 inch
Cold	.012 inch
(*b*) Alternater belt	1/2 inch deflection between pulleys
(*c*) Fan belt	1/2 inch deflection between pulleys
(*d*) Engine clutch	Tighten until a definite snap is noted when clutch is engaged.
(*e*) Fuel pump press	
Normal	45—65 psi (pounds per square inch)
Minimum	30 psi
(*f*) Governor gap setting	.006 inch
(*g*) Clutch shaft clutches	
(*h*) Power load lowering and power boom lowering clutches	.006 to .008 in clearance between shoe and drum
Hoist brakes	See para 3-15 chapter 111
Boom hoist brake	See para 3-15 chapter 111
Crawler belts	See para 3-22 chapter 111
Crawler drive chains	See para 3-21 chapter 111

(8) *Dimensions and weight.*

a. Basic machine.

Length	15 ft—6 in.
Width	10 ft—2 in.
Height	10 ft—2 1/2 in.
Weight	43,200 lbs.
Volume	1,616 cu. ft.

b. Crane boom (figs. 1-1, 1-2)

Length	31ft—8in.
Width	3 ft—4 in.
Height	2 ft—9 in.
Weight	3,150 lbs
Volume	225 cu. ft.

c. Shovel front (figs. 1-3, 1-4)

Length	25 ft—0 in.
Width	3 ft—5 in.
Height	3 ft—6 in.
Weight	7,450 lbs.
Volume	297 cu. ft

d. Backhoe (figs. 1-5, 1-6)

Length	21 ft.—0 in.
Width	3 ft.—3 1/2 inches
Height	4 ft—6 in.
Weight	4,608 lbs.
Volume	315 cu. ft.

e. Hookblock (figs. 1-1, 1-2)

Length	2 ft—8 in.
Width	1 ft—4 in.
Height	9 ft.
Weight	260 lbs.
Volume	2.7 cu. ft.

1-5. Differences in Models

This manual covers only the Thew-Lorain Model L-36M crane-shovel. No known unit differences exist for the model covered by this manual.

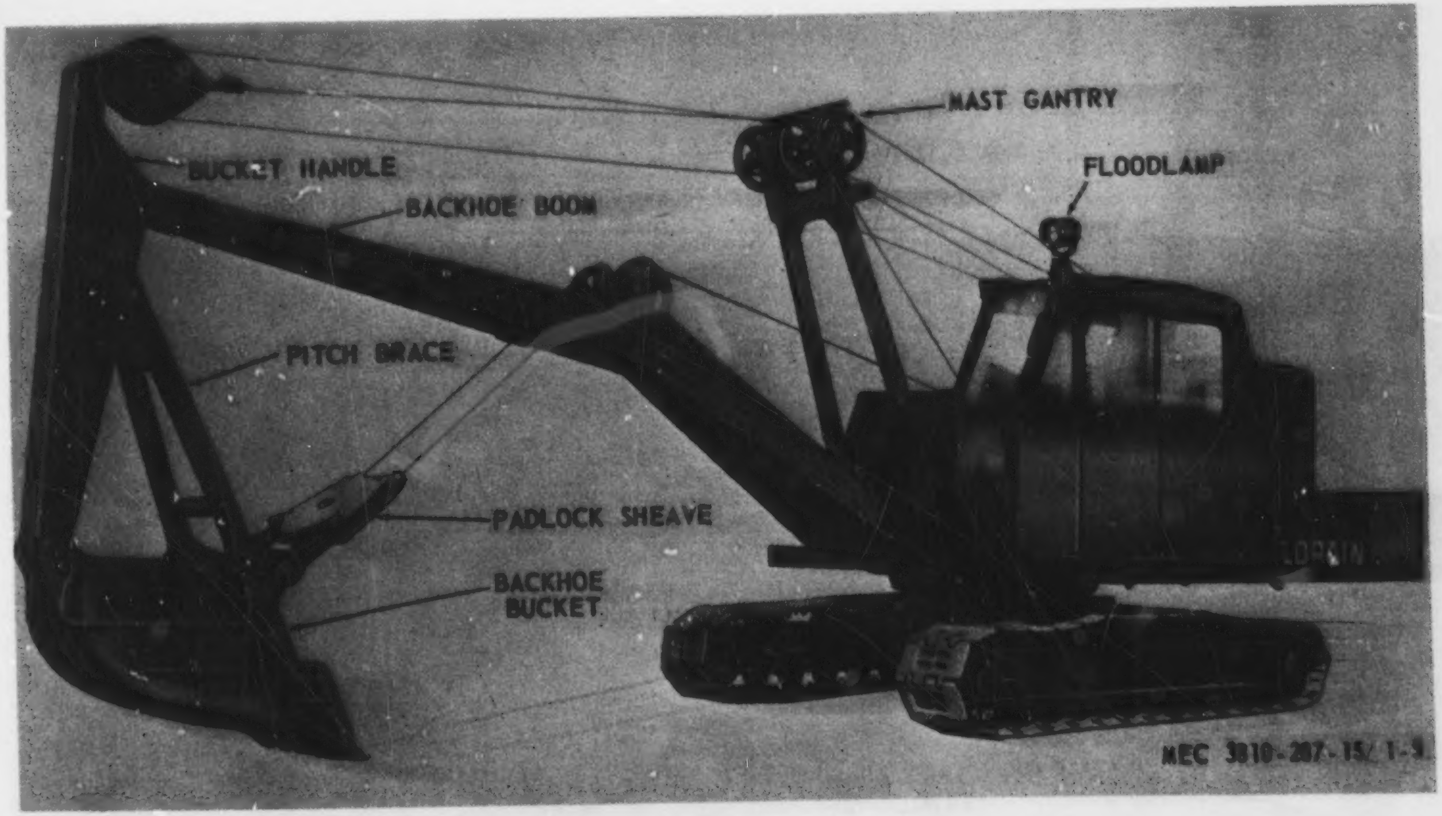

MAST GANTRY
FLOODLAMP
BUCKET HANDLE
BACKHOE BOOM
PITCH BRACE
PADLOCK SHEAVE
BACKHOE BUCKET
LORAIN
MEC 3810-287-15/1-5

Figure 1-5. Lorain backhoe, left-front, three-quarter view.

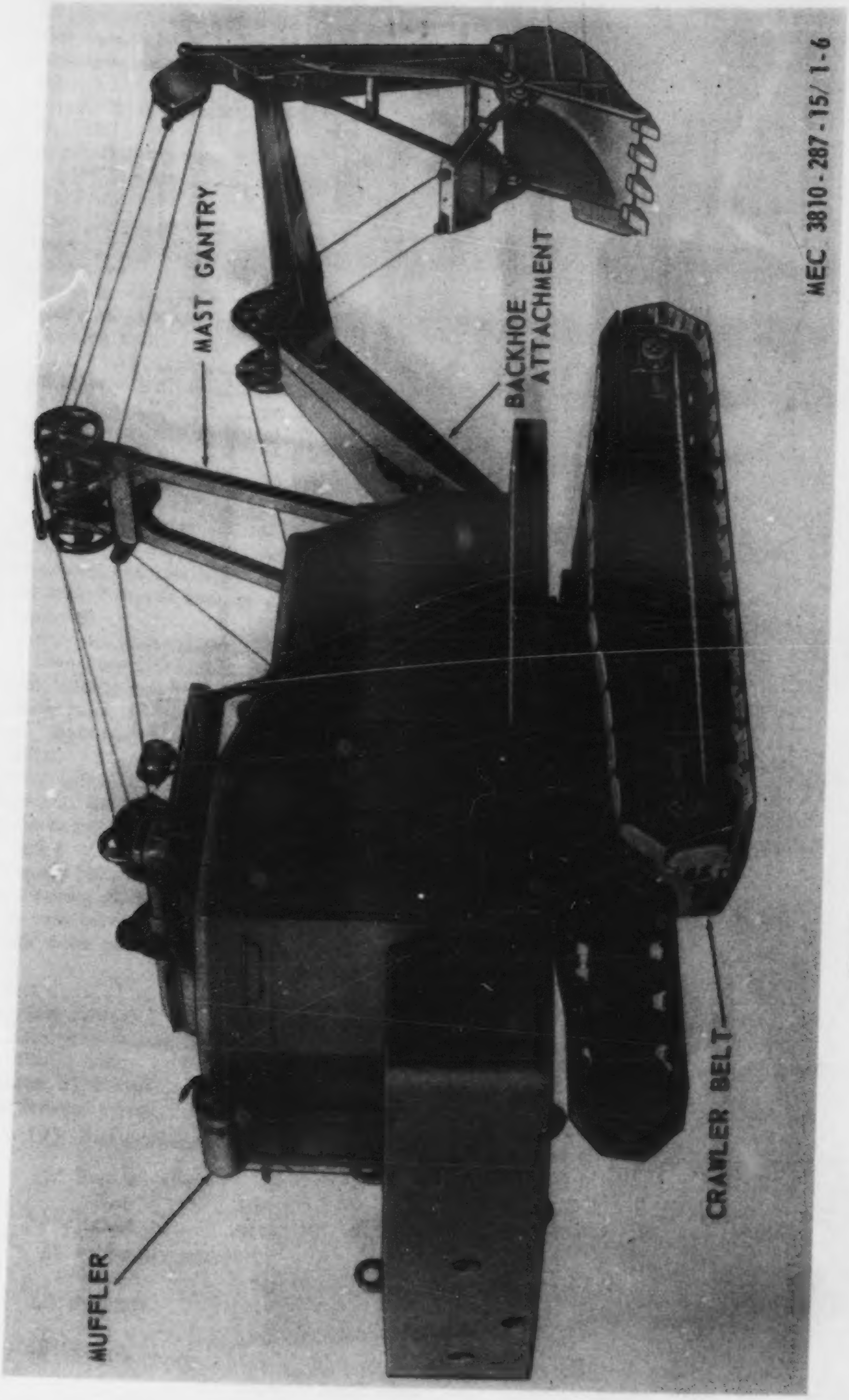
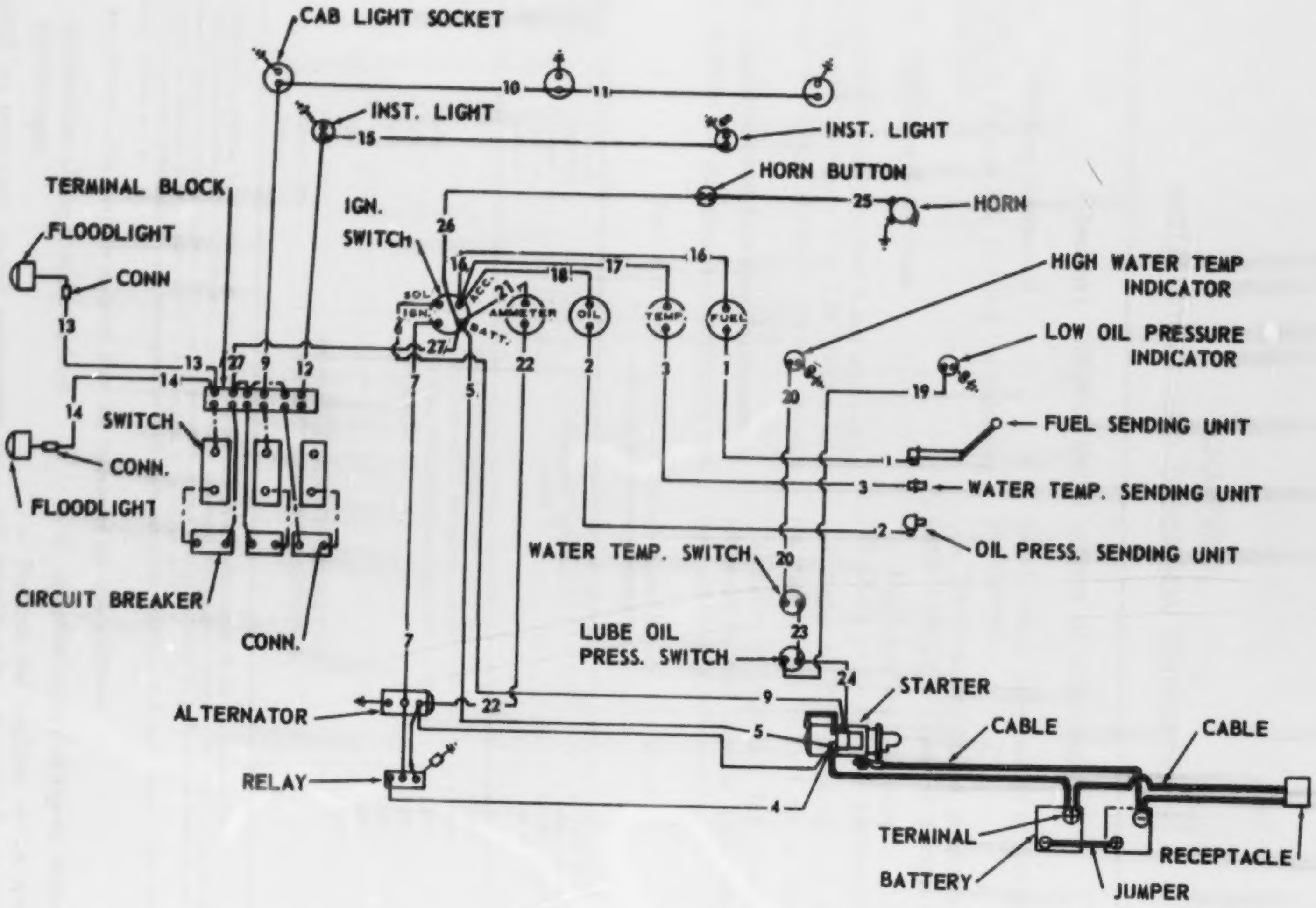

MUFFLER
MAST GANTRY
BACKHOE ATTACHMENT
CRAWLER BELT
MEC 3810-287-15/1-6

Figure 1-6. Lorain backhoe, right-rear, three-quarter view.


CAB LIGHT SOCKET
INST. LIGHT
INST. LIGHT
HORN BUTTON
HORN
TERMINAL BLOCK
FLOODLIGHT
CONN
IGN. SWITCH
SOL.
IGN.
ACC.
BATT.
AMMETER
OIL
TEMP.
FUEL
HIGH WATER TEMP INDICATOR
LOW OIL PRESSURE INDICATOR
FUEL SENDING UNIT
WATER TEMP. SENDING UNIT
OIL PRESS. SENDING UNIT
SWITCH
CONN.
FLOODLIGHT
CIRCUIT BREAKER
CONN.
WATER TEMP. SWITCH
LUBE OIL PRESS. SWITCH
STARTER
CABLE
CABLE
ALTERNATOR
RELAY
TERMINAL
BATTERY
JUMPER
RECEPTACLE
10
11
15
25
26
16
17
18
21
16
13
13
14
14
27
9
12
6
27
7
5
22
2
3
1
20
19
1
3
2
20
23
24
9
22
5
4
7

MEC 3810-287-15/ 1-7

Figure 1-7. Practical wiring diagram.

CHAPTER 2
INSTALLATION AND OPERATION INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

2-1. Unloading Equipment

Refer to figures 2-1, and 2-2 for unloading instructions.

2-2. Unpacking Equipment

Unpack separately packed items and components shown on figure 2-4. Use caution when opening crates and boxes to prevent damage.

2-3. Inspection and Servicing Equipment

a. Remove all covering and protective materials which were used to protect the machine in shipment.

b. Perform the daily preventive maintenance services outlined in paragraph 3-6.

c. Lubricate the crane-shovel (LO 5-3810-287-15-1) as outlined in paragraph 3-3.

d. Refer to TM 9-6140-200-15 for servicing and testing instructions on the batteries.

e. Refer to table 2-1 for freezing points, composition, and specific gravities of military antifreeze solutions.

Table 2-1. Freezing Points, Composition, and Specific Gravities of Military Antifreeze Materials.

Lowest expected ambient temp. °F	Pints of inhibited glycol gal. of coolant [1]	Compound, Antifreeze Arctic [2]	Ethylene glycol coolant solution specific gravity at 68°F [3]
20	1 1/2	Issued full strength and ready mixed for 0 to -65°F temperatures for both initial installation and replenishment of losses.	1.022
10	2		1.036
0	2 3/4		1.047
-10	3 1/4		1.055
-20	3 1/2		1.062
-30	4		1.067
-40	4 1/4		1.073
-50	Arctic Antifreeze preferred	DO NOT DILUTE WITH WATER OR ANY OTHER SUBSTANCE	
-60			
-75			

[1] Maximum protection is obtained at 60 percent by volume (4.8 pints of ethylene glycol per gallon of solution).

[2] Military Specifications MIL-C-11755 arctic type, nonvolatile antifreeze compound is intended for use in the cooling system of liquid-cooled internal combustion engines. It is used for protection against freezing primarily in arctic regions where the ambient temperature remains for extended periods close to -40°F or drops below, to as low as -90°F.

[3] Use an accurate hydrometer. To test hydrometer, use 1 part ethylene glycol antifreeze to 2 parts water. This should produce a hydrometer reading of 0°F.

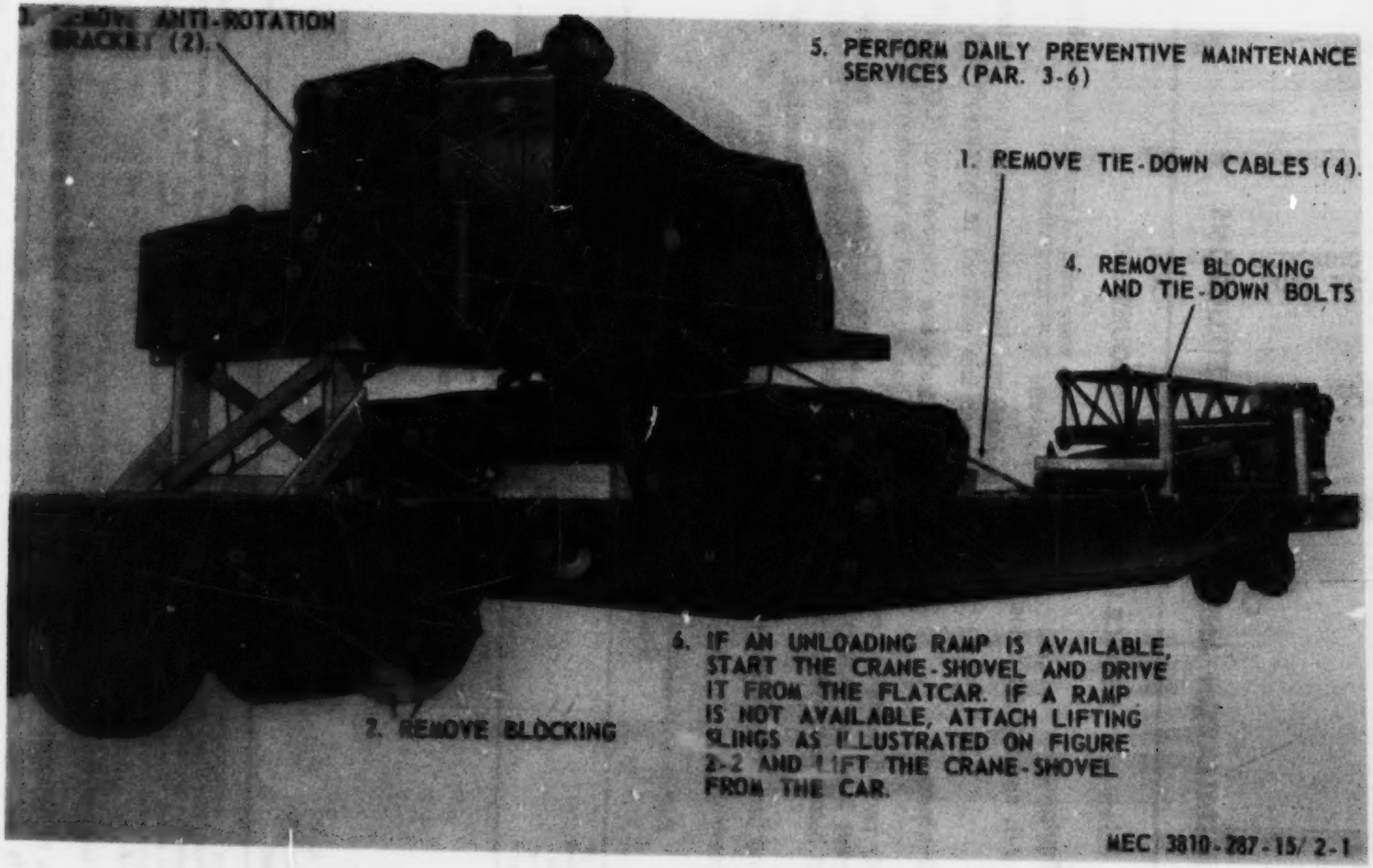
Note. Fasten a tag near the radiator filler cap indicating the type antifreeze.

2-4. Installation of Separately Packed Components

Install the separately packed components as instructed on figure 2-5.

2-5. Installation or Setting-up Instructions

a. Position the machine in an area which will provide adequate room for installation of the 30 foot crane boom.



3. REMOVE ANTI-ROTATION BRACKET (2).
5. PERFORM DAILY PREVENTIVE MAINTENANCE SERVICES (PAR. 3-6)
1. REMOVE TIE-DOWN CABLES (4).
4. REMOVE BLOCKING AND TIE-DOWN BOLTS
2. REMOVE BLOCKING
6. IF AN UNLOADING RAMP IS AVAILABLE, START THE CRANE-SHOVEL AND DRIVE IT FROM THE FLATCAR. IF A RAMP IS NOT AVAILABLE, ATTACH LIFTING SLINGS AS ILLUSTRATED ON FIGURE 2-2 AND LIFT THE CRANE-SHOVEL FROM THE CAR.
MEC 3810-287-15/2-1

Figure 2-1. Blocking and tie-down.

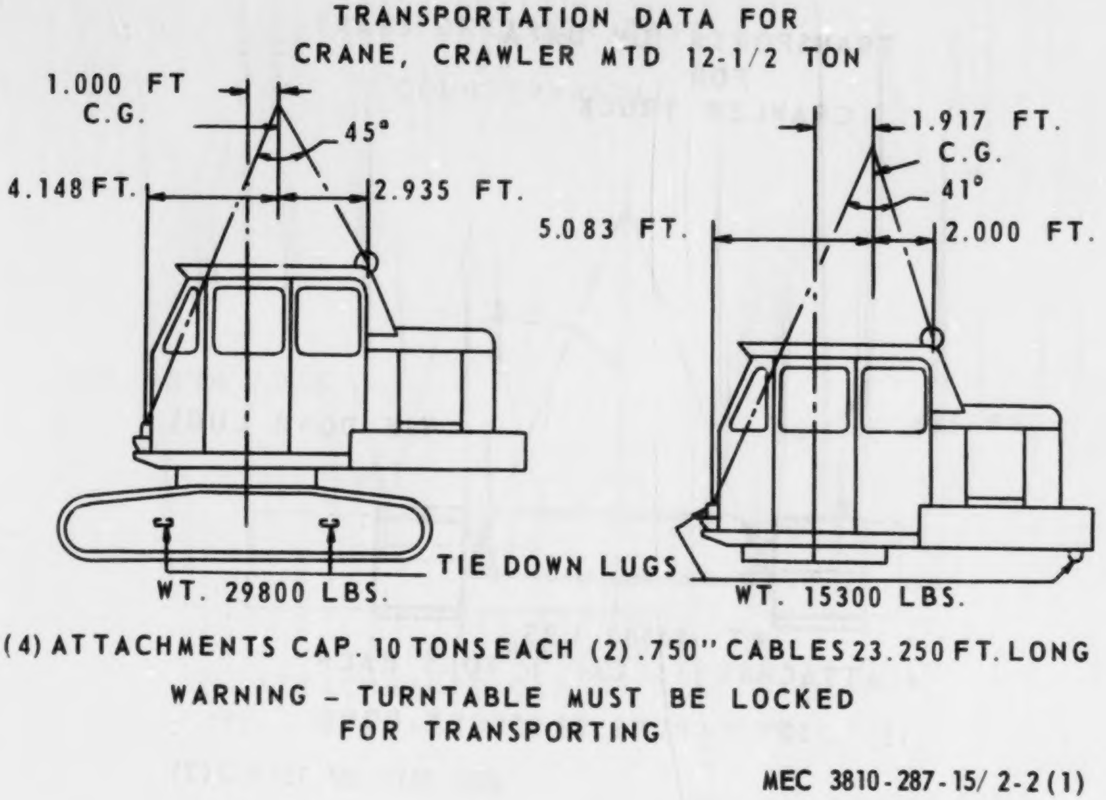

TRANSPORTATION DATA FOR
CRANE, CRAWLER MTD 12-1/2 TON
1.000 FT
C.G.
45°
4.148 FT.
2.935 FT.
1.917 FT.
C.G.
41°
5.083 FT.
2.000 FT.
TIE DOWN LUGS
WT. 29800 LBS.
WT. 15300 LBS.
(4) ATTACHMENTS CAP. 10 TONS EACH (2) .750" CABLES 23.250 FT. LONG
WARNING - TURNTABLE MUST BE LOCKED
FOR TRANSPORTING
MEC 3810-287-15/ 2-2 (1)

Figure 2-2. (1) Lifting slings.

b. Using a suitable lifting device, position the crane boom as illustrated on figure 2-6 and install the boom foot pins, keeper plates (2), capscrews (4) and lockwashers (4).

Warning: **Do not operate the Lorain crane-shovel in an enclosed area unless exhaust gases are piped to the outside. Inhalation of exhaust fumes will result in serious illness or death.**

2-6. Boom Harness and Cables

a. Installation.

(1) Install the boom harness and cables as illustrated on figure 2-7.

(2) Refer to figure 2-6 for boom harness reeving.

b. Removal. Remove the boom harness and cables in reverse of the instructions in figure 2-7.

2-7. Boom Insert Sections

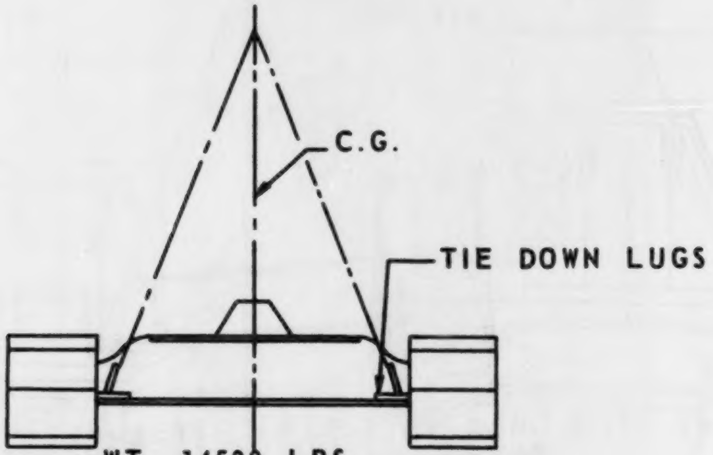
a. General. Boom insert sections in 10 foot lengths are used to increase the length of boom for high rise construction and other uses where long booms are required.

b. Installation. Install boom insert sections as instructed on figure 2-8.

Note. When installing insert sections of varying lengths, the shorter sections must be positioned near the base section. Example: If two 5 foot sections and one 10 foot section were being installed, the two 5 foot sections would be attached to the base section, then the 10 foot section, and finally the peak section. Keep pendant cables with their respective section to reduce handling time.

c. Boom insert removal. Remove the boom insert sections in reverse of the instructions on figure 2-8.

TRANSPORTATION DATA FOR CRAWLER TRUCK



WT. 14500 LBS.
4 ATTACHMENTS CAP 6 TONS EACH
(2) .750" CABLES 23.250 FT. LONG

MEC 3810-287-15/ 2-2 (2)

Figure 2-2. (2)—Continued.

Table 2-2. Cable Data Chart

			Crane cable			
			Cable length (ft.)			
Boom length	Size	Code	30	40	50	60
HOIST Cable – 1 Part line	5/8	S	73	93	113	133
2 Part line	5/8	S	108	138	168	198
3 Part line	5/8	S	143	183	223	263
4 Part line	5/8	S	178	228	278	328
		Boom hoist cable – crane – clam – drag				
	Size	Code	30	40	50	60
10 Part harness	1/2"	S	250'	250'	250'	250'
			Clam shell cables			
			Cable length (ft.)			
Boom length	Size	Code	30			
Closing line cable	5/8	S	114'			
Holding line cable	5/8	S	114'			
Tagline cable	5/16	H	65'			

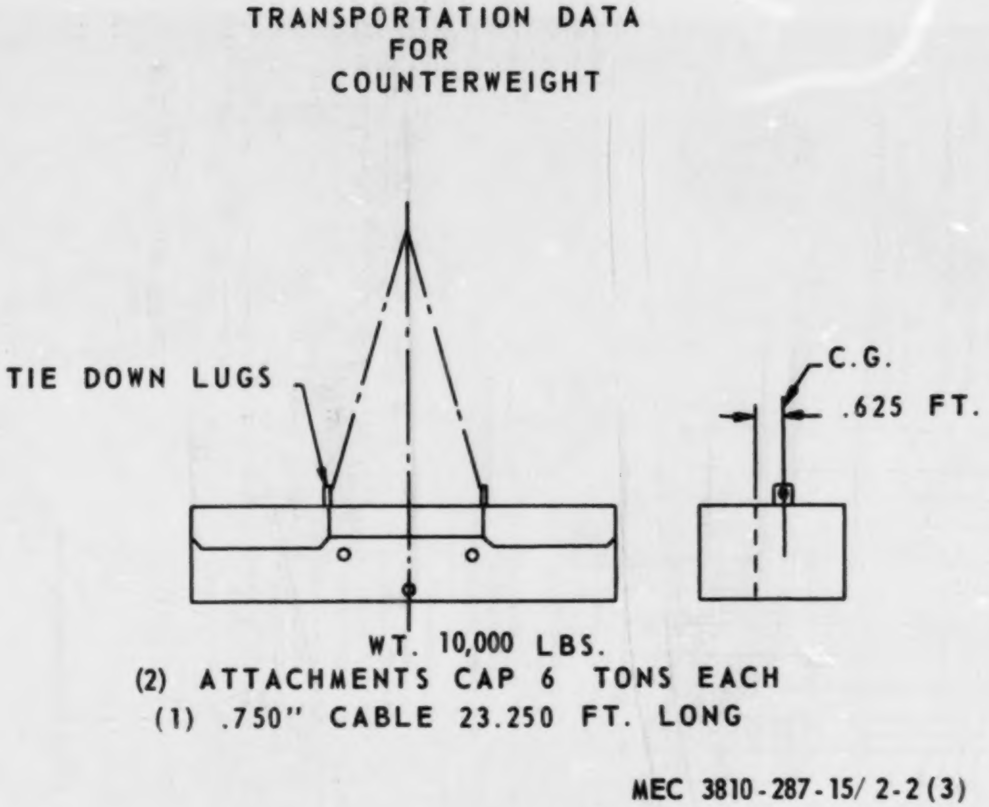

TRANSPORTATION DATA
FOR
COUNTERWEIGHT
TIE DOWN LUGS
C.G.
.625 FT.
WT. 10,000 LBS.
(2) ATTACHMENTS CAP 6 TONS EACH
(1) .750" CABLE 23.250 FT. LONG
MEC 3810-287-15/ 2-2 (3)

Figure 2-2. (3)—Continued.

Table 2-2. Cable Data Chart—Continued.

Shovel cables

9'-0 Boom	Size	Code	Stick 16'-0"
Boom hoist cable	5/8"	S	120'
Hoist cable	5/8"	S	75'
Crowd cable	5/8"	S	41'-7"
Retract cable	5/8"	S	47'-0"
Dipper trip cable	1/4	H	40'

Hoe cables

	Side	Code	Length
Hoe mast	5/8"	S	85'

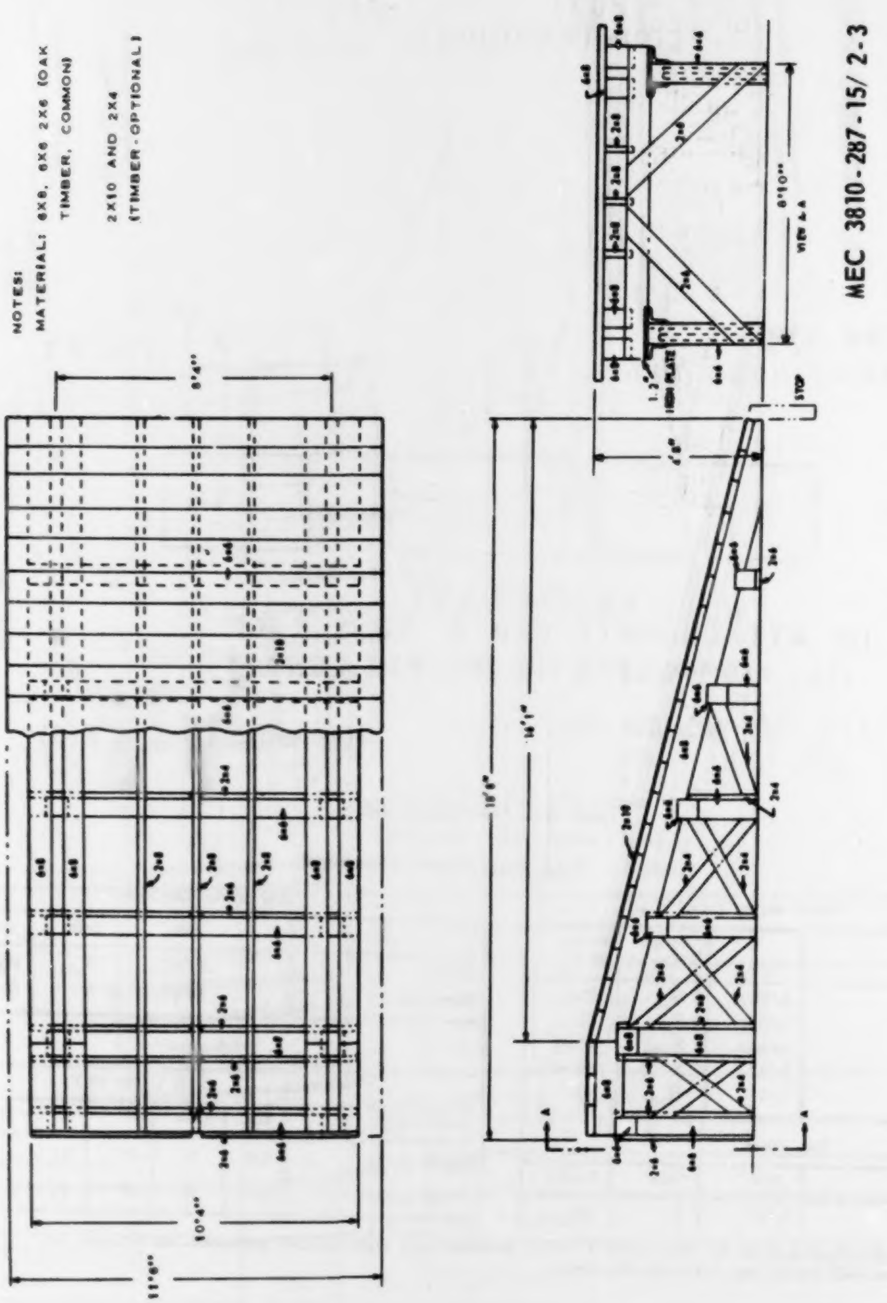
Hoe cables—Continued

	Side	Code	Length
Hoist	5/8"	S	96'
Drag-in	3/4"	S	60

Dragline cables

	Cable length (ft.)			
Boom length	Size	Code	30	40
Hoist cable	5/8	S	77'	97'
Drag cable	3/4	S	35'	45'

Code "S" — RR-W-410 Type 1, Class 2, Construction 3, IWRC improved plow steel, uncoated, preformed, right regular lay.
Code "H" Hemp center 6X25 regular lay, improved plow steel.



NOTES:
MATERIAL: 6X8, 6X6 2X6 (OAK TIMBER, COMMON)
2X10 AND 2X4 (TIMBER-OPTIONAL)

8'4"
10'4"
11'6"
16'6"
14'1"
4'8"
8'10"
VIEW A-A
STOP
1/2" IRON PLATE
A
6x8
6x6
2x8
2x6
2x4
2x10
MEC 3810-287-15/ 2-3

Figure 2-3. Unloading ramp.

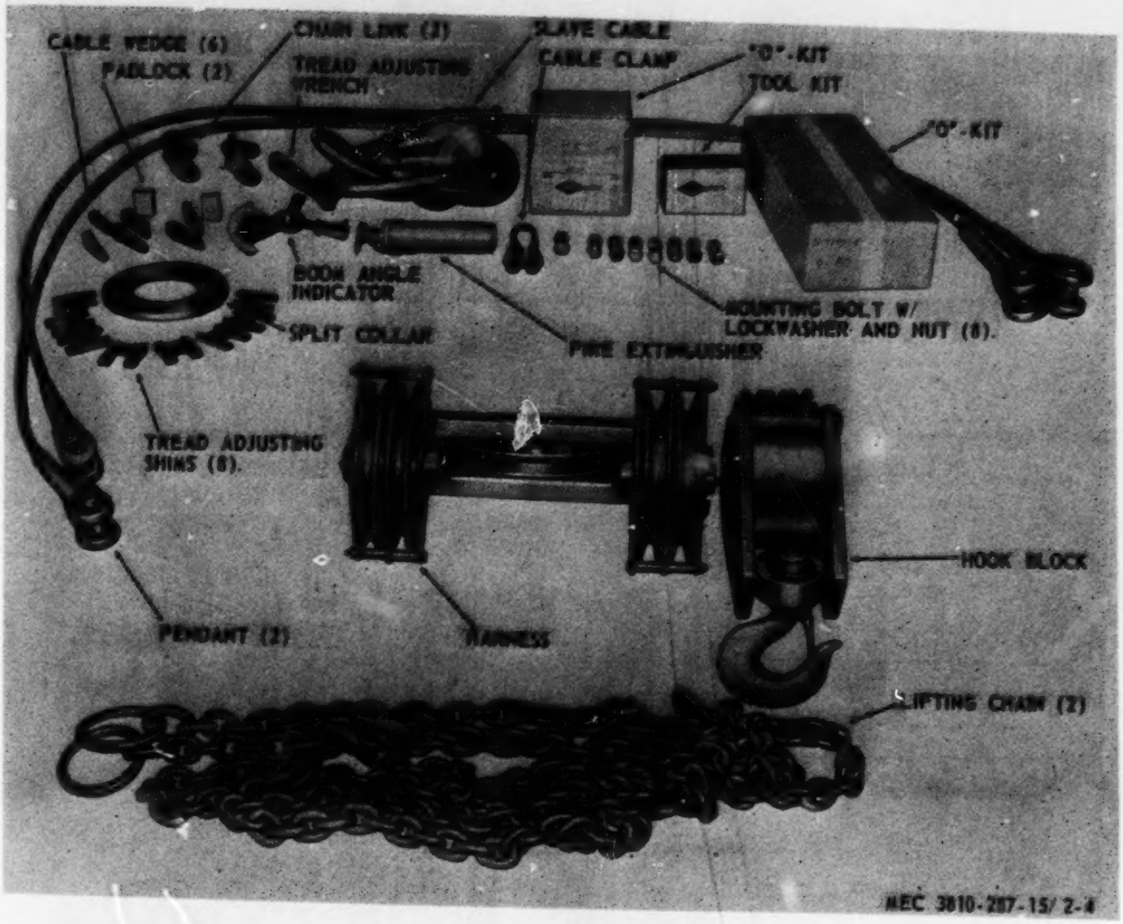

CABLE WEDGE (6)
PADLOCK (2)
CHAIN LINK (2)
TREAD ADJUSTING WRENCH
SLAVE CABLE
CABLE CLAMP
"O"-KIT
TOOL KIT
"O"-KIT
BOOM ANGLE INDICATOR
SPLIT COLLAR
FIRE EXTINGUISHER
MOUNTING BOLT W/ LOCKWASHER AND NUT (8).
TREAD ADJUSTING SHIMS (8).
PENDANT (2)
HARNESS
HOOK BLOCK
LIFTING CHAIN (2)
MEC 3810-287-15/ 2-4

Figure 2-4. Unpacking equipment.

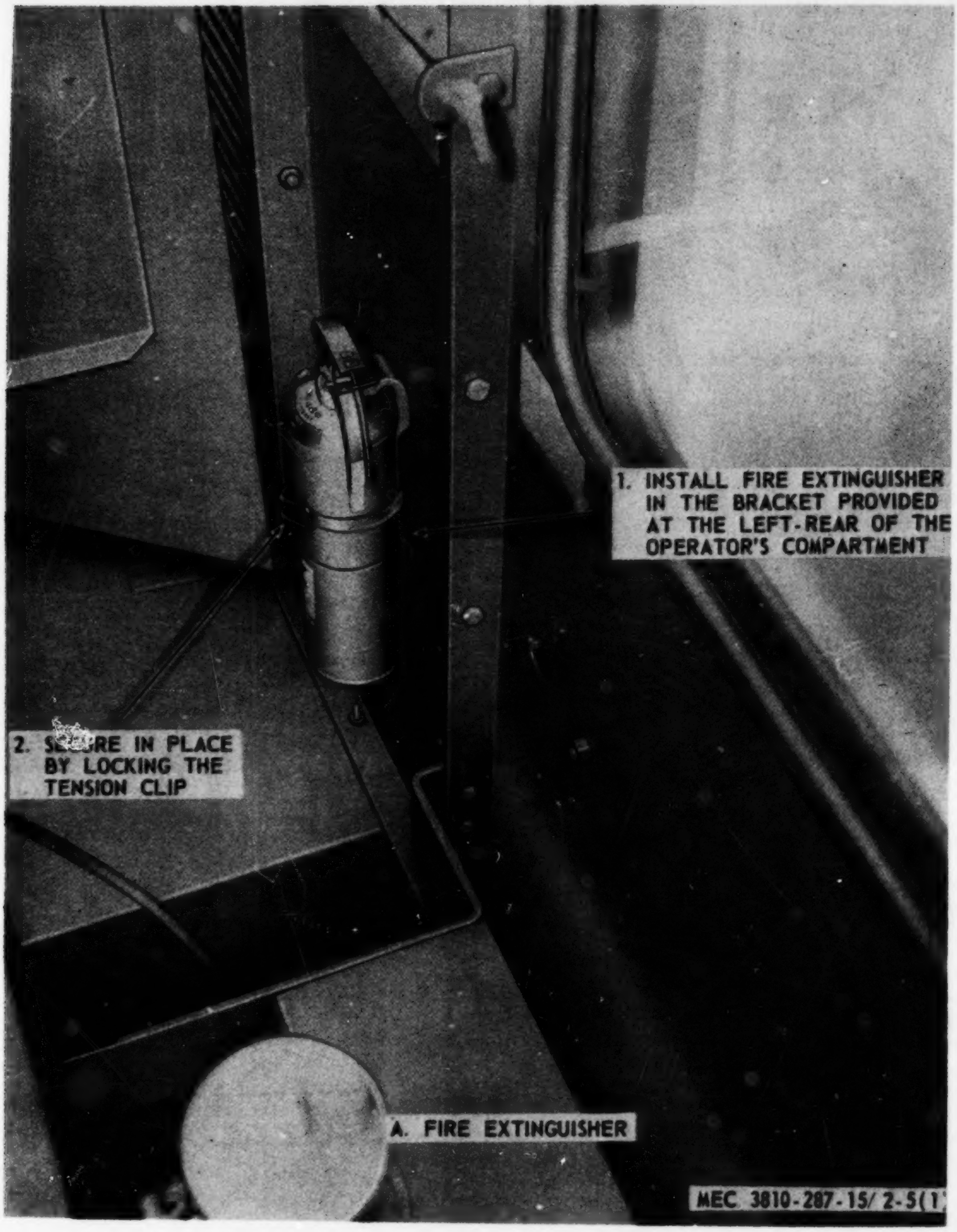
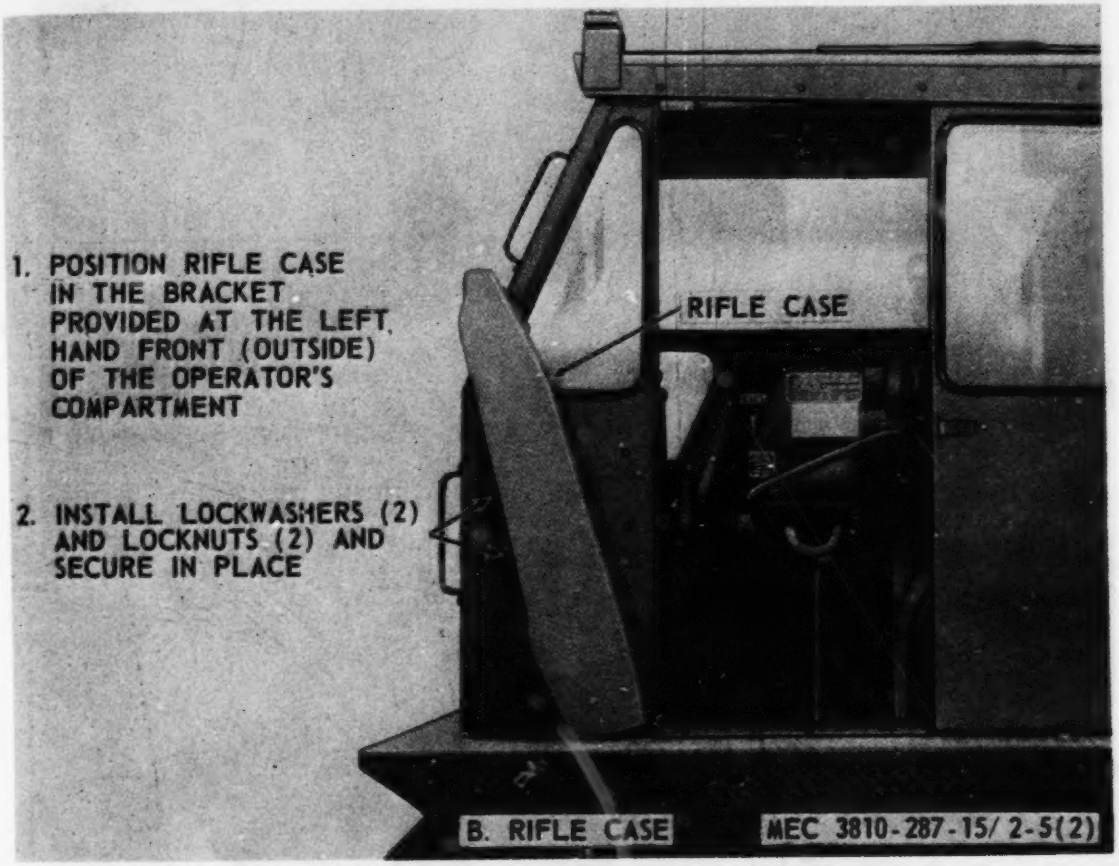

1. INSTALL FIRE EXTINGUISHER IN THE BRACKET PROVIDED AT THE LEFT-REAR OF THE OPERATOR'S COMPARTMENT
2. SECURE IN PLACE BY LOCKING THE TENSION CLIP
A. FIRE EXTINGUISHER
MEC 3810-287-15/2-5(1)

Figure 2-5. (1). Installation of separately packed components.

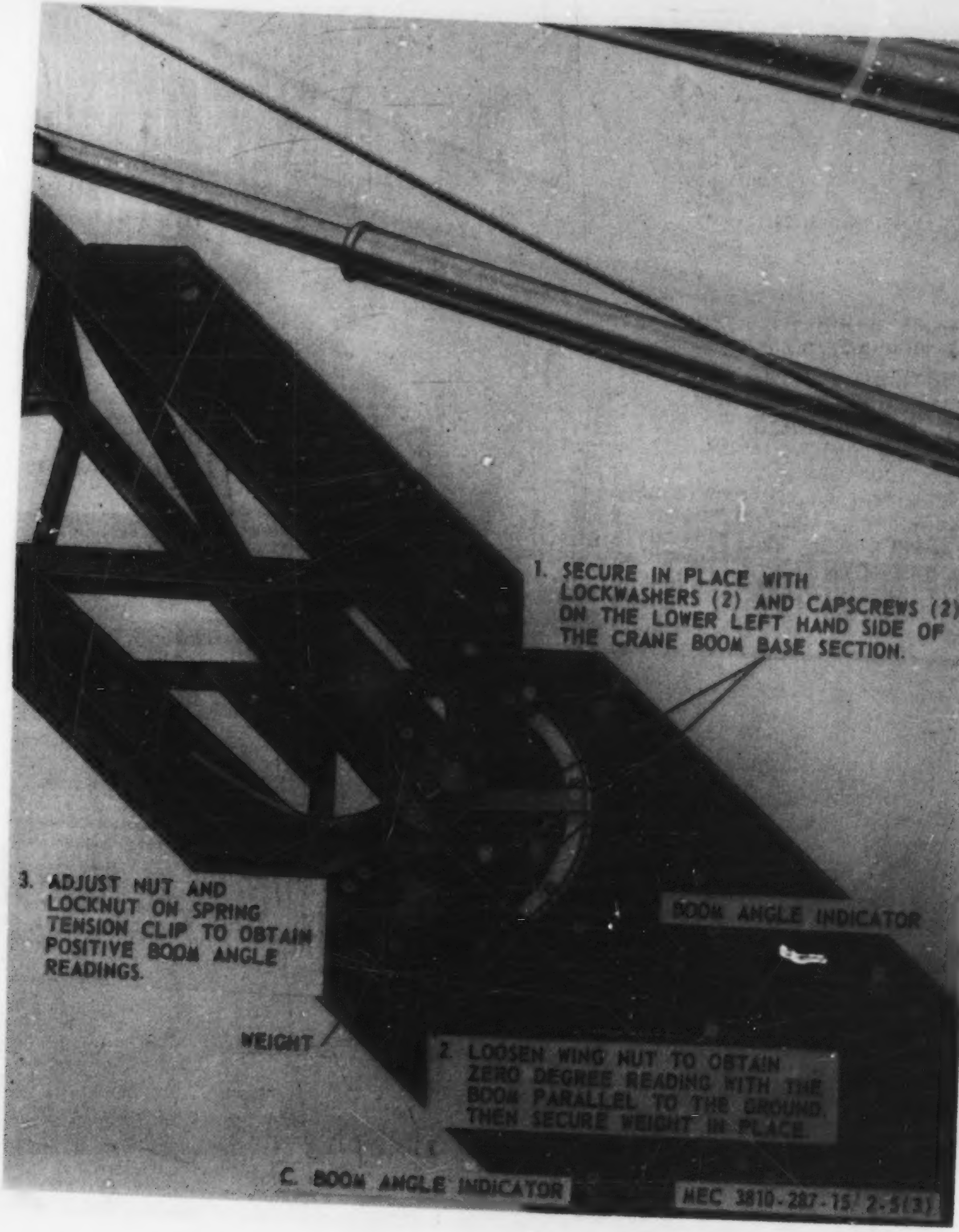


1. POSITION RIFLE CASE IN THE BRACKET PROVIDED AT THE LEFT HAND FRONT (OUTSIDE) OF THE OPERATOR'S COMPARTMENT

2. INSTALL LOCKWASHERS (2) AND LOCKNUTS (2) AND SECURE IN PLACE

RIFLE CASE
B. RIFLE CASE
MEC 3810-287-15/2-5(2)

Figure 2-5. (2).—Continued.


BOOM ANGLE INDICATOR
WEIGHT
MEC 3810-287-15/2-5(3)

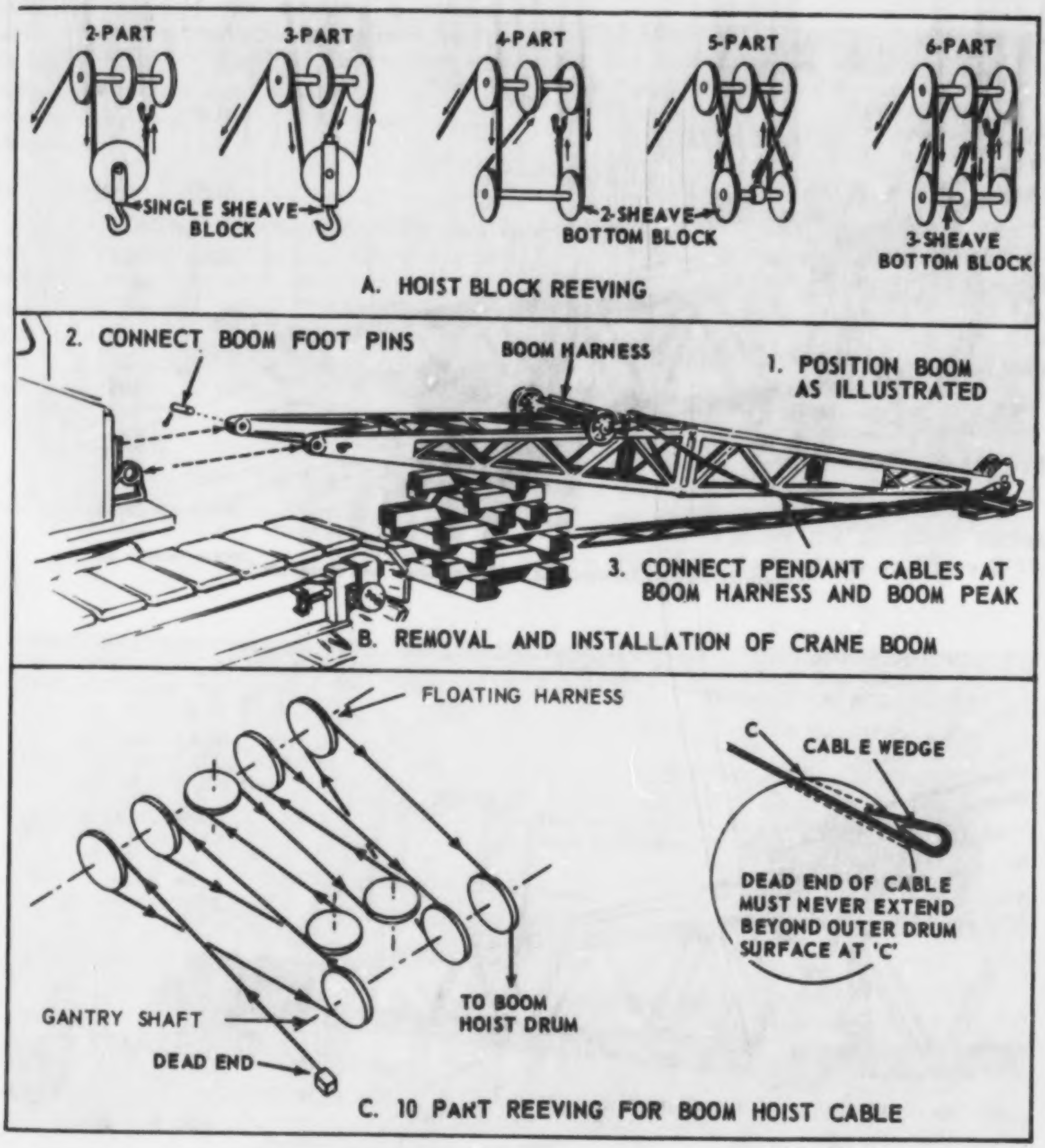
1. SECURE IN PLACE WITH LOCKWASHERS (2) AND CAPSCREWS (2) ON THE LOWER LEFT HAND SIDE OF THE CRANE BOOM BASE SECTION.

2. LOOSEN WING NUT TO OBTAIN ZERO DEGREE READING WITH THE BOOM PARALLEL TO THE GROUND, THEN SECURE WEIGHT IN PLACE.

3. ADJUST NUT AND LOCKNUT ON SPRING TENSION CLIP TO OBTAIN POSITIVE BOOM ANGLE READINGS.

C. BOOM ANGLE INDICATOR

Figure 2-5. (3).—Continued.


2-PART
3-PART
4-PART
5-PART
6-PART
SINGLE SHEAVE BLOCK
2-SHEAVE BOTTOM BLOCK
3-SHEAVE BOTTOM BLOCK
A. HOIST BLOCK REEVING
2. CONNECT BOOM FOOT PINS
BOOM HARNESS
1. POSITION BOOM AS ILLUSTRATED
3. CONNECT PENDANT CABLES AT BOOM HARNESS AND BOOM PEAK
B. REMOVAL AND INSTALLATION OF CRANE BOOM
FLOATING HARNESS
C
CABLE WEDGE
DEAD END OF CABLE MUST NEVER EXTEND BEYOND OUTER DRUM SURFACE AT 'C'
GANTRY SHAFT
DEAD END
TO BOOM HOIST DRUM
C. 10 PART REEVING FOR BOOM HOIST CABLE

MEC 3810-287-15/2-6

Figure 2-6. Crane boom installation.

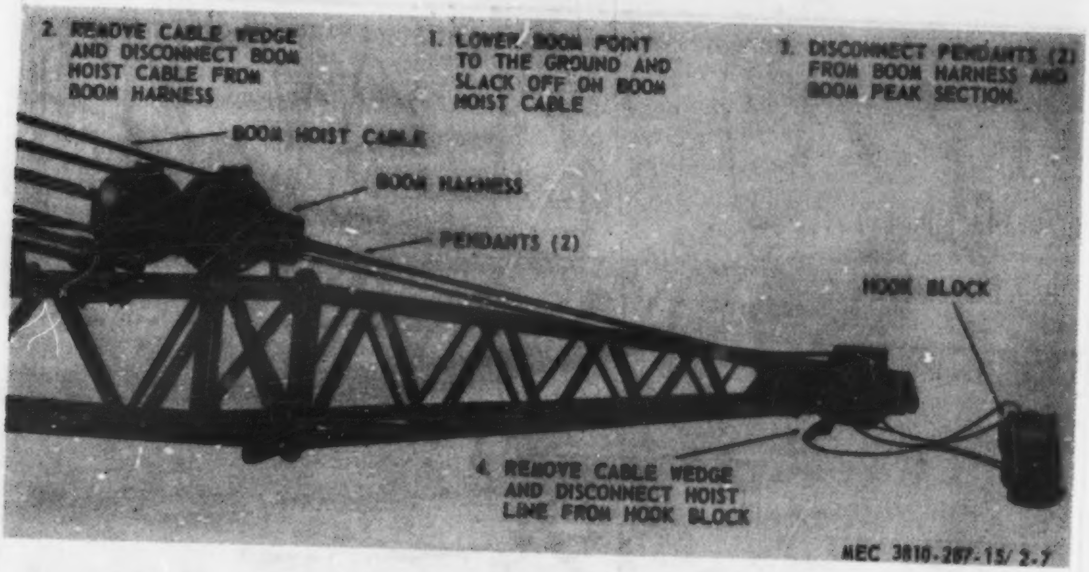

2. REMOVE CABLE WEDGE AND DISCONNECT BOOM HOIST CABLE FROM BOOM HARNESS
1. LOWER BOOM POINT TO THE GROUND AND SLACK OFF ON BOOM HOIST CABLE
3. DISCONNECT PENDANTS (2) FROM BOOM HARNESS AND BOOM PEAK SECTION.
BOOM HOIST CABLE
BOOM HARNESS
PENDANTS (2)
HOOK BLOCK
4. REMOVE CABLE WEDGE AND DISCONNECT HOIST LINE FROM HOOK BLOCK
MEC 3810-287-15/ 2-7

Figure 2–7. Boom harness and cables, removal and installation.

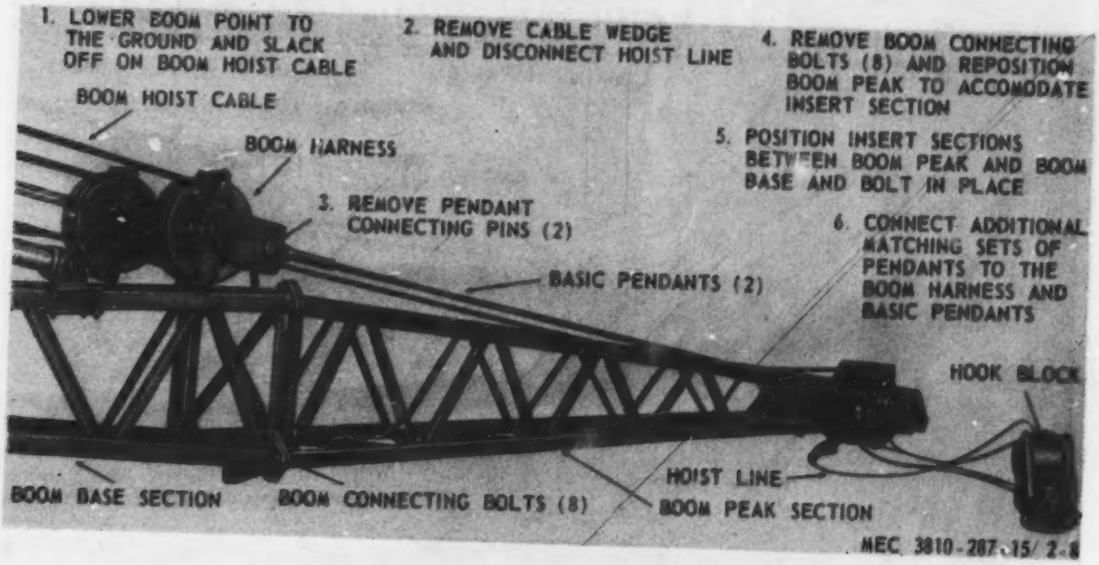

1. LOWER BOOM POINT TO THE GROUND AND SLACK OFF ON BOOM HOIST CABLE
2. REMOVE CABLE WEDGE AND DISCONNECT HOIST LINE
4. REMOVE BOOM CONNECTING BOLTS (8) AND REPOSITION BOOM PEAK TO ACCOMODATE INSERT SECTION
BOOM HOIST CABLE
BOOM HARNESS
5. POSITION INSERT SECTIONS BETWEEN BOOM PEAK AND BOOM BASE AND BOLT IN PLACE
3. REMOVE PENDANT CONNECTING PINS (2)
6. CONNECT ADDITIONAL MATCHING SETS OF PENDANTS TO THE BOOM HARNESS AND BASIC PENDANTS
BASIC PENDANTS (2)
HOOK BLOCK
HOIST LINE
BOOM BASE SECTION
BOOM CONNECTING BOLTS (8)
BOOM PEAK SECTION
MEC 3810-287-15/ 2-8

Figure 2–8. Boom insert sections, removal and installation.

Section II. EQUIPMENT CONVERSION

2–8. General

This section covers the conversion of the Lorian model L–36M crane-shovel from a lifting crane to a dragline, clamshell, backhoe or shovel. The following paragraphs provide detailed instructions for converting the machine from a crane to any of the attachments available for use. If the machine is already equipped with other than a crane boom, refer to the applicable paragraph for removal instructions, and the applicable paragraph of the attachment being installed for installation instructions.

2-9. Dragline Bucket

a. General. The dragline is normally used for ditch excavation, stripping, and other jobs where the spoil must be deposited at some distance from the excavation. The dragline bucket is used in conjunction with the crane boom and fairlead, and is easily removed for conversion to clamshell or crane attachment as required.

b. Installation.

(1) Refer to figure 2-9 and install the dragline bucket.

(2) Install Military Standard Fairlead to the crane boom.

c. Removal.

(1) Remove the dragline bucket in reverse of the instructions on figure 2-9.

(2) Remove the Military Standard Fairlead from the crane boom.

2-10. Clamshell Bucket Installation

a. General. The clamshell bucket is generally used for digging footers, trenches, and pier holes, stock piling of loose materials, loading hauling units, and charging bins. The clamshell is capable of handling material both above and below ground level, and can spot dump at any level of operation.

b. Installation. Refer to figure 2-10 and install the clamshell bucket.

c. Removal. Remove the clamshell bucket in reverse of the instructions on figure 2-10.

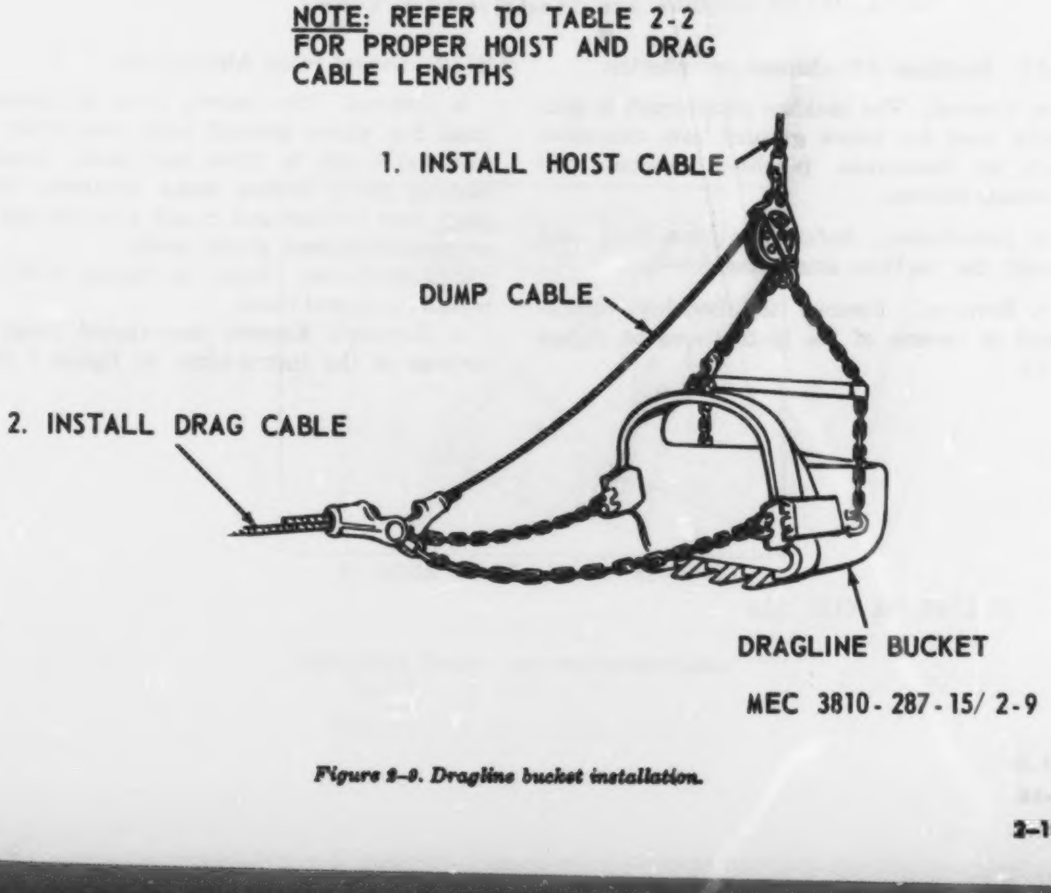


Figure 2-9. Dragline bucket installation.

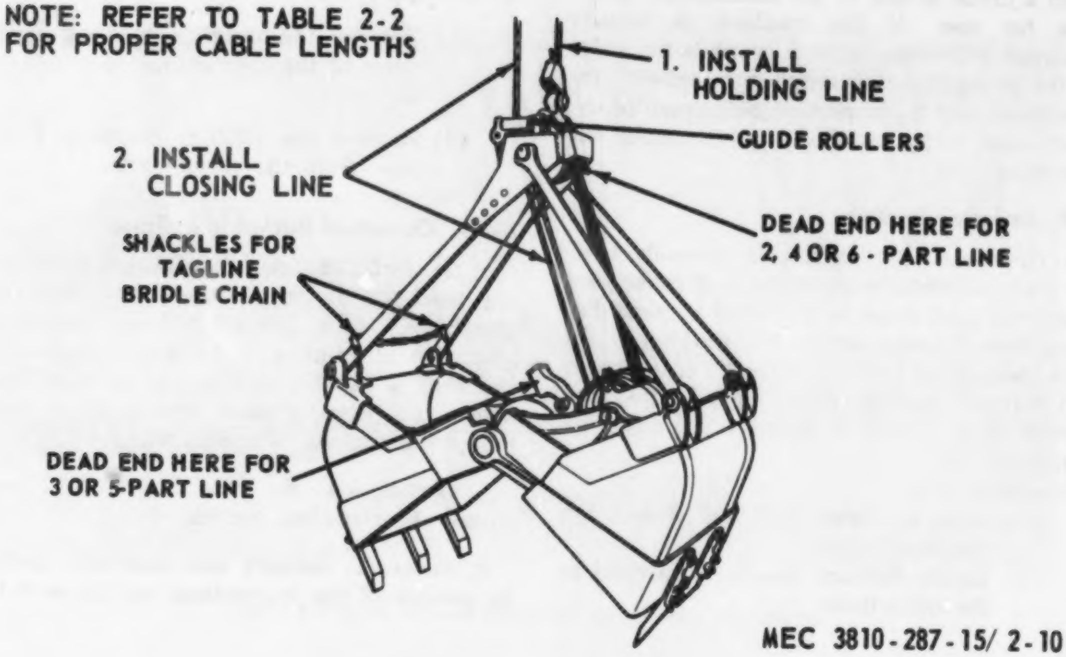

NOTE: REFER TO TABLE 2-2
FOR PROPER CABLE LENGTHS
1. INSTALL HOLDING LINE
GUIDE ROLLERS
2. INSTALL CLOSING LINE
DEAD END HERE FOR 2, 4 OR 6 - PART LINE
SHACKLES FOR TAGLINE BRIDLE CHAIN
DEAD END HERE FOR 3 OR 5-PART LINE
MEC 3810-287-15/ 2-10

Figure 2-10. Clamshell bucket installation.

2-11. Backhoe Attachment Installation

a. General. The backhoe attachment is generally used for below ground level exavation such as basements, pipeline trenches, and drainage ditches.

b. Installation. Refer to figure 2-11 and install the backhoe attachment.

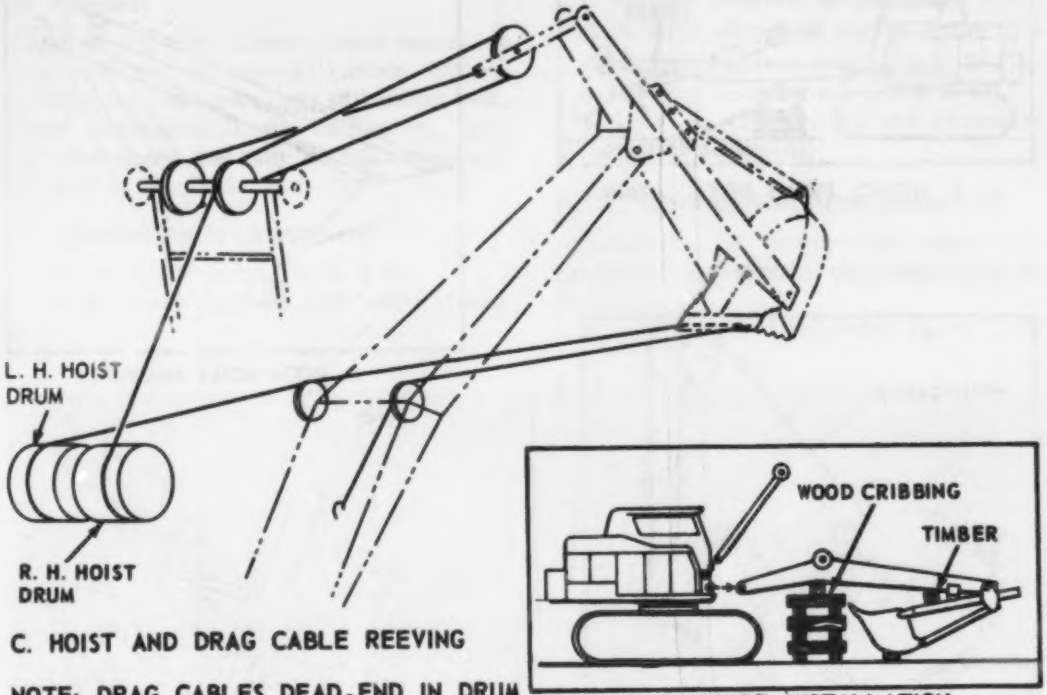
c. Removal. Remove the backhoe attachment in reverse of the instructions on figure 2-11.

2-12. Shovel Front Attachment

a. General. The shovel front is generally used for above ground level excavation of material which is firm and hard. Loading hauling units, feeding stone crushers, stripping over burden and rough grading are examples of normal shovel work.

b. Installation. Refer to figure 2-12 and install the shovel front.

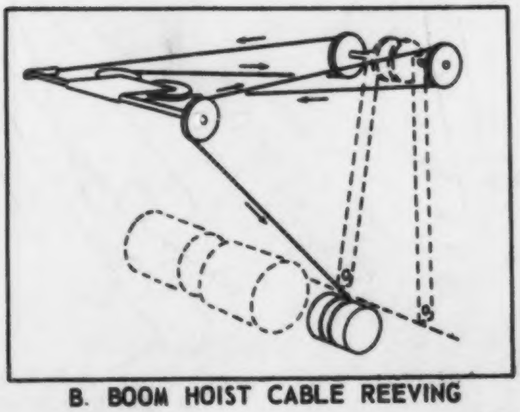
c. Removal. Remove the shovel front in reverse of the instructions on figure 2-12.


L. H. HOIST DRUM
R. H. HOIST DRUM
WOOD CRIBBING
TIMBER

C. HOIST AND DRAG CABLE REEVING

NOTE: DRAG CABLES DEAD-END IN DRUM

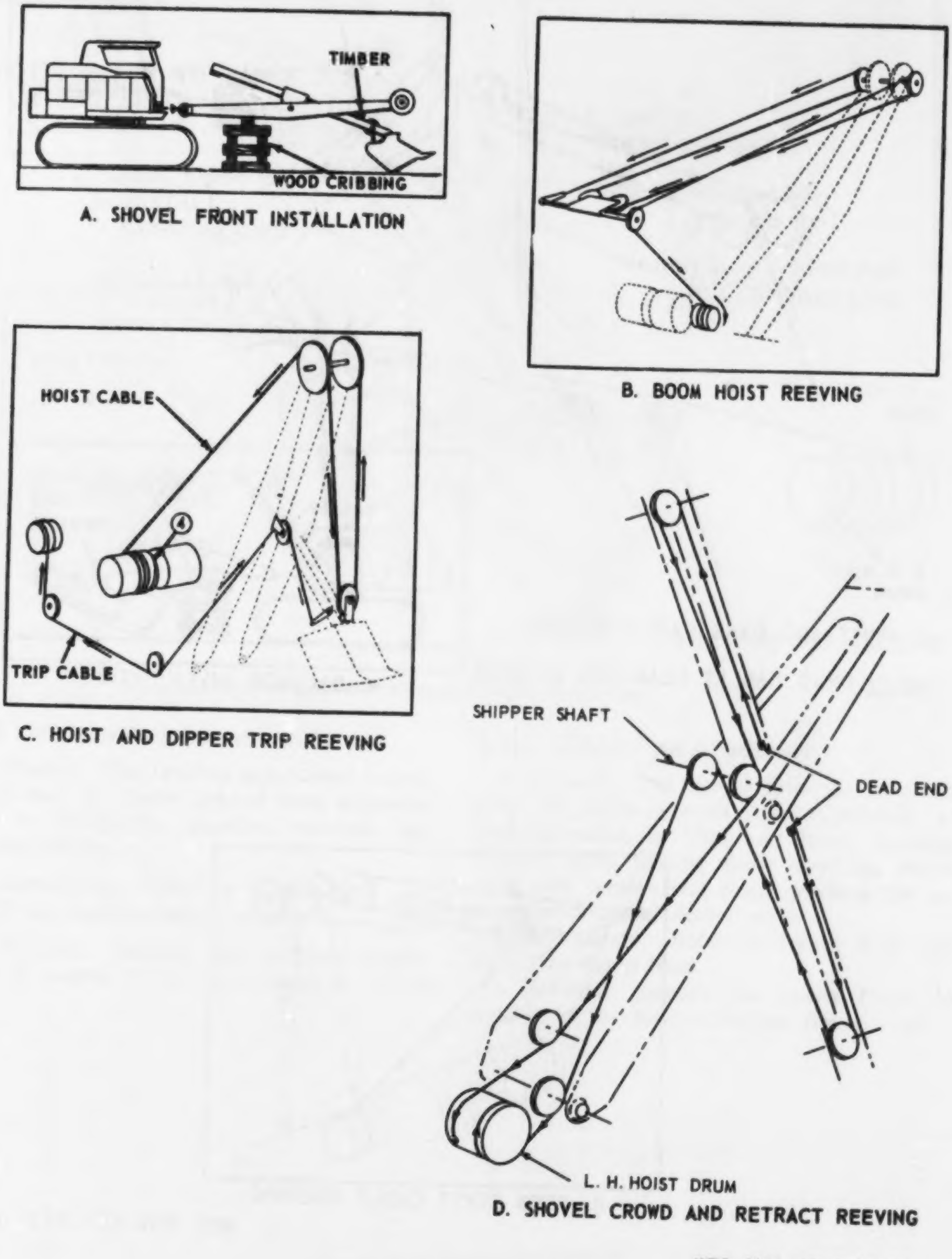
A. BACKHOE INSTALLATION



B. BOOM HOIST CABLE REEVING

MEC 3810-287-15/ 2-11

Figure 2-11. Backhoe attachment installation.


TIMBER
WOOD CRIBBING
HOIST CABLE
4
TRIP CABLE
SHIPPER SHAFT
DEAD END
L. H. HOIST DRUM

A. SHOVEL FRONT INSTALLATION

B. BOOM HOIST REEVING

C. HOIST AND DIPPER TRIP REEVING

D. SHOVEL CROWD AND RETRACT REEVING

MEC 3810-287-15/ 2-12

Figure 2-12. Shovel front installation.

Section III. MOVEMENT TO A NEW WORKSITE

2-13. General

When moving the Lorain crane-shovel, it may be necessary to remove various components from the machine. Type of hauling unit, overhead clearances, length limitations, and weight allowances normally dictate the extent of dismantling required.

2-14. Dismantling for Movement

a. Remove crane boom (para 2-5).

b. Remove boom harness and cable (para 2-6).

c. Remove dragline bucket (para 2-9).

d. Remove clamshell bucket (para 2-10).

e. Remove backhoe front (para 2-11).

f. Remove shovel-front (para 2-12).

g. Refer to figure 2-13 and dismantle the machine for movement.

2-15. Reinstallation After Movement

a. Install the components removed for movement in reverse of the instructions on figure 2-13.

b. Install the shovel-front (para 2-12).

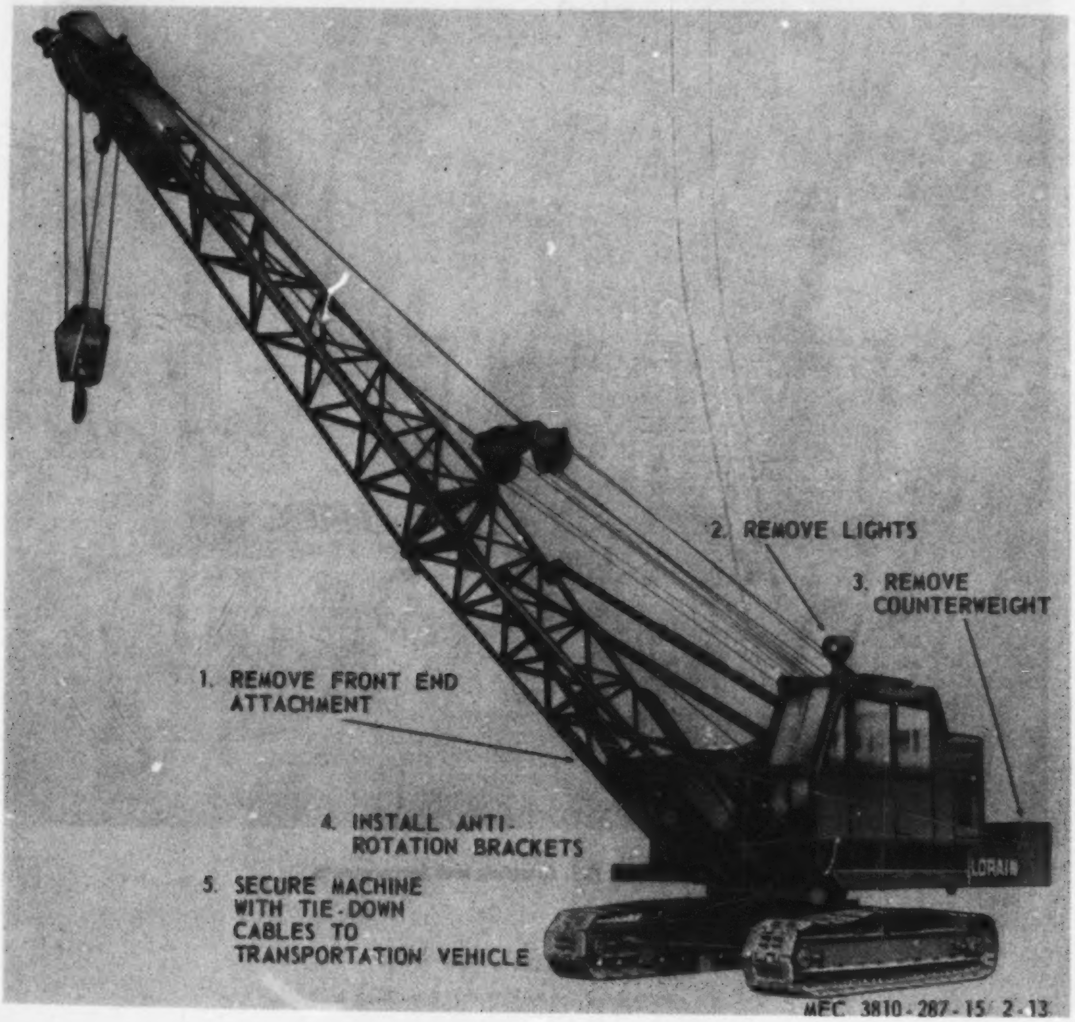

2. REMOVE LIGHTS
3. REMOVE COUNTERWEIGHT
1. REMOVE FRONT END ATTACHMENT
4. INSTALL ANTI-ROTATION BRACKETS
5. SECURE MACHINE WITH TIE-DOWN CABLES TO TRANSPORTATION VEHICLE
LORAIN
MEC 3810-287-15 2-13

Figure 2-13. Dismantling for movement.

c. Install the backhoe front (para 2-11).

d. Install the clamshell bucket (para 2-10).

e. Install the dragline bucket (para 2-9).

f. Install the boom harness and cable (para 2-6).

g. Install the crane boom (para 2-5).

Section IV. CONTROLS AND INSTRUMENTS

2-16. General

This section describes, locates, illustrates, and furnishes operator, crew, or organizational maintenance personnel sufficient information about various controls and instruments for proper operation of the Lorain model L-36M crane-shovel.

2-17. Controls and Instruments

The purpose of controls and instruments and their normal and maximum readings are illustrated on figure 2-14.

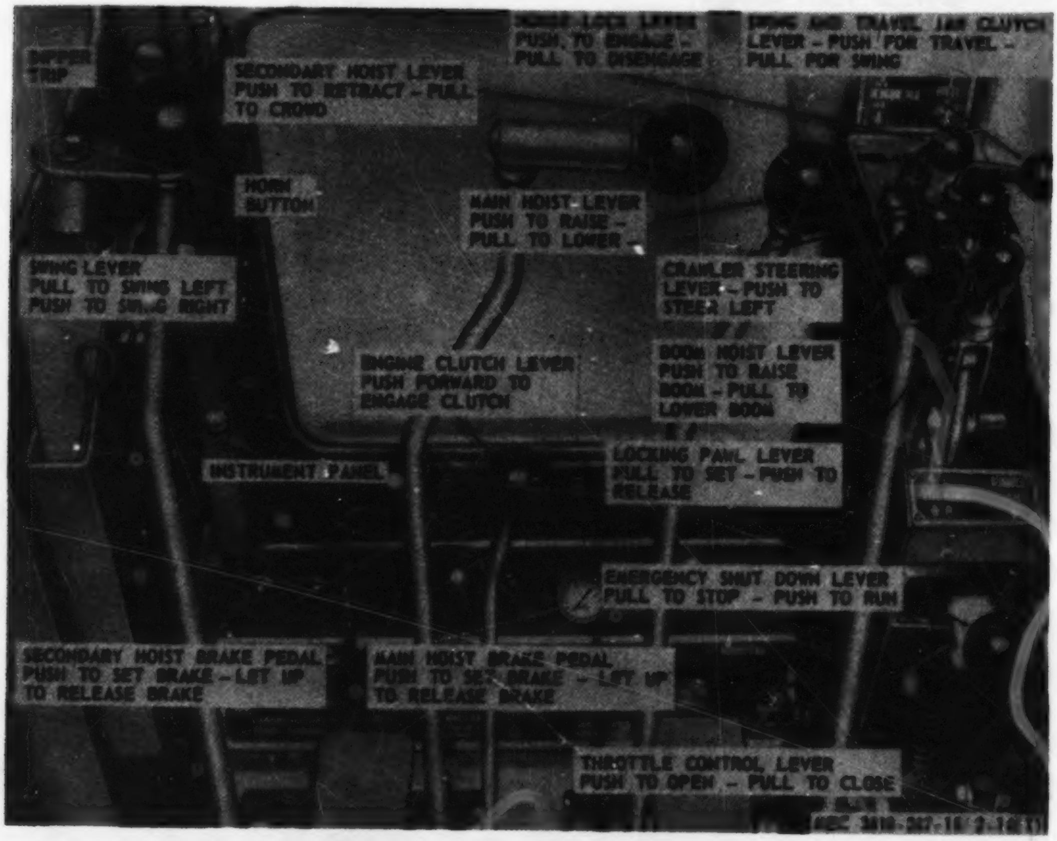

DIPPER TRIP
SECONDARY HOIST LEVER PUSH TO RETRACT - PULL TO CROWD
HOIST LOCK LEVER PUSH TO ENGAGE - PULL TO DISENGAGE
SWING AND TRAVEL JAW CLUTCH LEVER - PUSH FOR TRAVEL - PULL FOR SWING
HORN BUTTON
MAIN HOIST LEVER PUSH TO RAISE - PULL TO LOWER
SWING LEVER PULL TO SWING LEFT PUSH TO SWING RIGHT
CRAWLER STEERING LEVER - PUSH TO STEER LEFT
ENGINE CLUTCH LEVER PUSH FORWARD TO ENGAGE CLUTCH
BOOM HOIST LEVER PUSH TO RAISE BOOM - PULL TO LOWER BOOM
INSTRUMENT PANEL
LOCKING PAWL LEVER PULL TO SET - PUSH TO RELEASE
EMERGENCY SHUT DOWN LEVER PULL TO STOP - PUSH TO RUN
SECONDARY HOIST BRAKE PEDAL PUSH TO SET BRAKE - LET UP TO RELEASE BRAKE
MAIN HOIST BRAKE PEDAL PUSH TO SET BRAKE - LET UP TO RELEASE BRAKE
THROTTLE CONTROL LEVER PUSH TO OPEN - PULL TO CLOSE
MEC 3810-287-15/2-14(1)

Figure 2-14 (1). Controls and instruments.

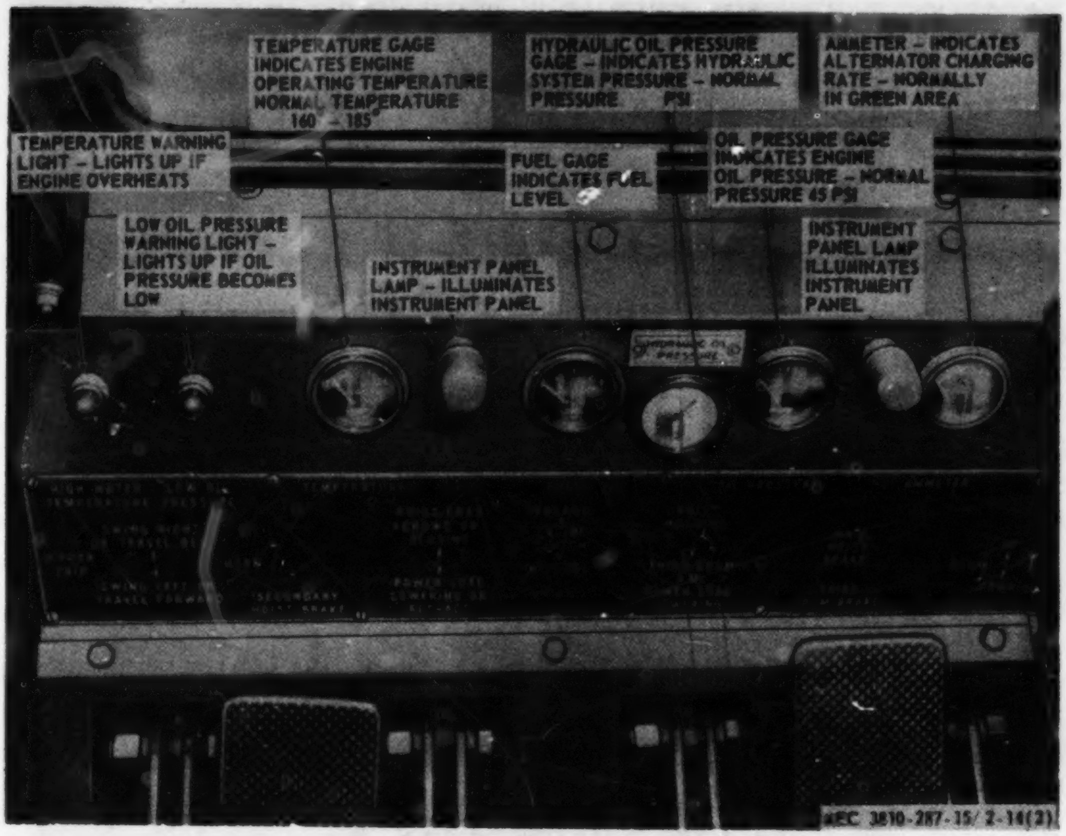

TEMPERATURE GAGE INDICATES ENGINE OPERATING TEMPERATURE NORMAL TEMPERATURE 160° - 185°
HYDRAULIC OIL PRESSURE GAGE - INDICATES HYDRAULIC SYSTEM PRESSURE - NORMAL PRESSURE PSI
AMMETER - INDICATES ALTERNATOR CHARGING RATE - NORMALLY IN GREEN AREA
TEMPERATURE WARNING LIGHT - LIGHTS UP IF ENGINE OVERHEATS
FUEL GAGE INDICATES FUEL LEVEL
OIL PRESSURE GAGE INDICATES ENGINE OIL PRESSURE - NORMAL PRESSURE 45 PSI
LOW OIL PRESSURE WARNING LIGHT - LIGHTS UP IF OIL PRESSURE BECOMES LOW
INSTRUMENT PANEL LAMP - ILLUMINATES INSTRUMENT PANEL
INSTRUMENT PANEL LAMP ILLUMINATES INSTRUMENT PANEL
MEC 3810-287-15/2-14(2)

Figure 2-14 (2).—Continued.

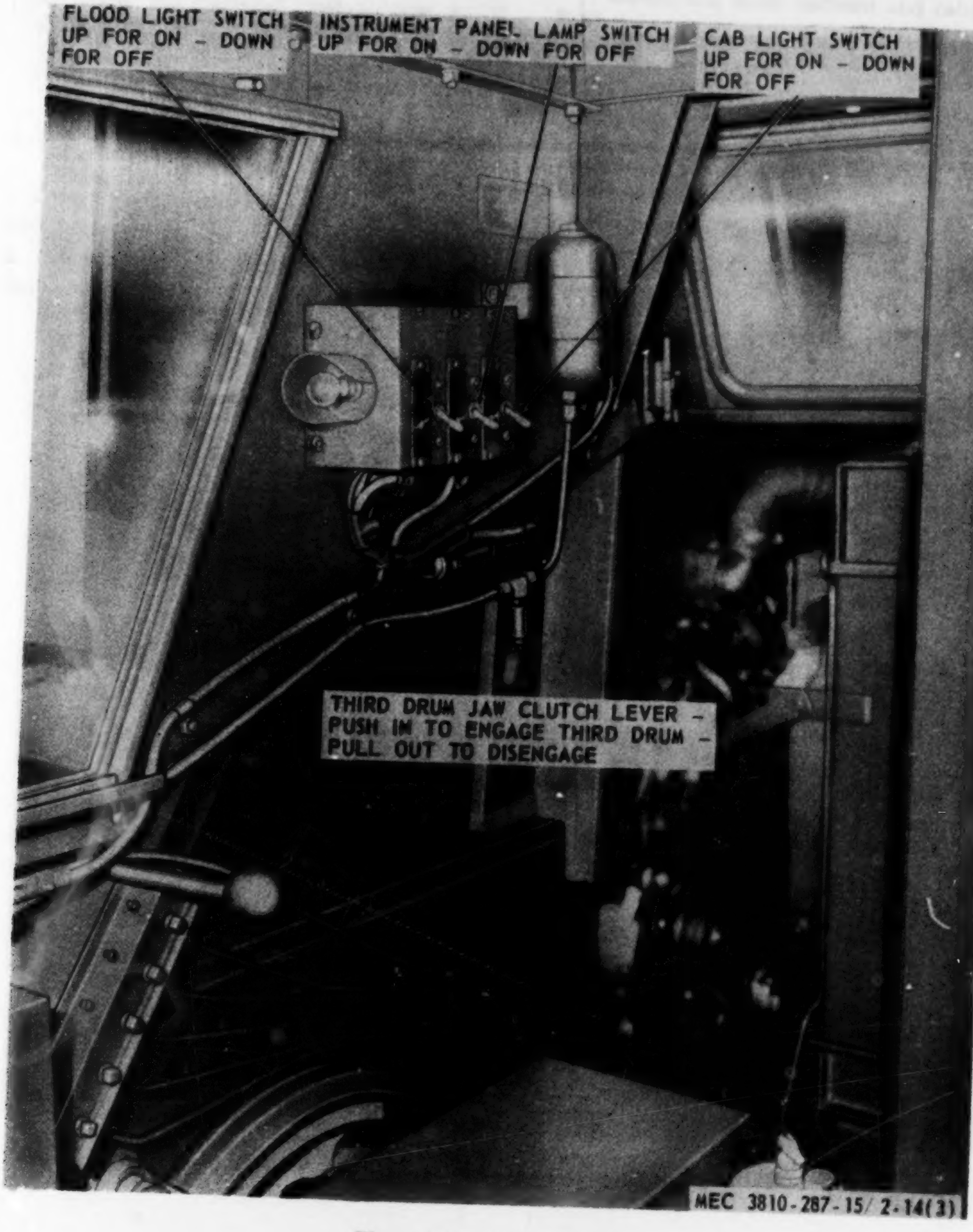

FLOOD LIGHT SWITCH UP FOR ON – DOWN FOR OFF
INSTRUMENT PANEL LAMP SWITCH UP FOR ON – DOWN FOR OFF
CAB LIGHT SWITCH UP FOR ON – DOWN FOR OFF
THIRD DRUM JAW CLUTCH LEVER – PUSH IN TO ENGAGE THIRD DRUM – PULL OUT TO DISENGAGE
MEC 3810-287-15/2-14(3)

Figure 2-14 (3).—Continued.

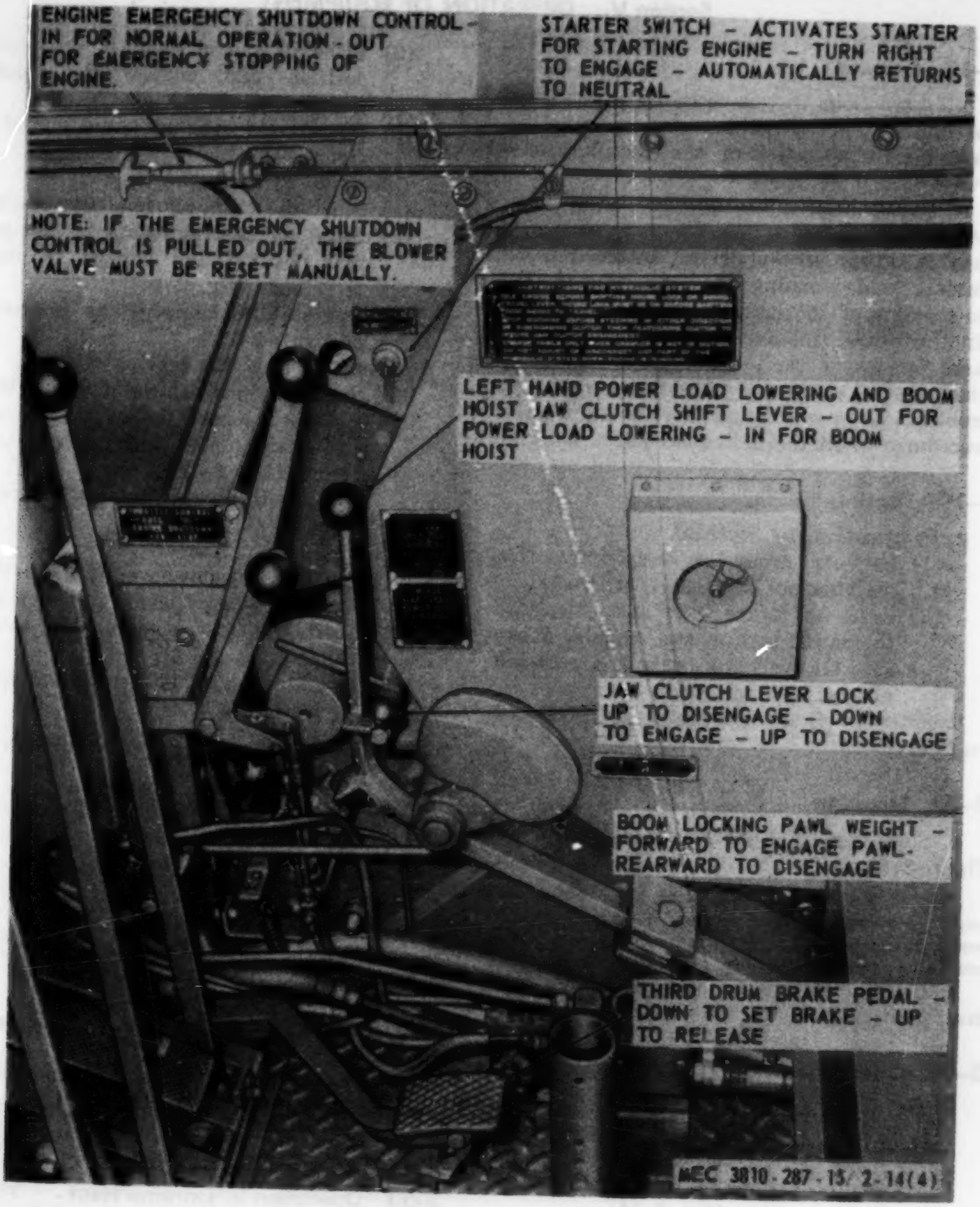

ENGINE EMERGENCY SHUTDOWN CONTROL - IN FOR NORMAL OPERATION - OUT FOR EMERGENCY STOPPING OF ENGINE.
STARTER SWITCH - ACTIVATES STARTER FOR STARTING ENGINE - TURN RIGHT TO ENGAGE - AUTOMATICALLY RETURNS TO NEUTRAL
NOTE: IF THE EMERGENCY SHUTDOWN CONTROL IS PULLED OUT, THE BLOWER VALVE MUST BE RESET MANUALLY.
LEFT HAND POWER LOAD LOWERING AND BOOM HOIST JAW CLUTCH SHIFT LEVER - OUT FOR POWER LOAD LOWERING - IN FOR BOOM HOIST
JAW CLUTCH LEVER LOCK UP TO DISENGAGE - DOWN TO ENGAGE - UP TO DISENGAGE
BOOM LOCKING PAWL WEIGHT - FORWARD TO ENGAGE PAWL. REARWARD TO DISENGAGE
THIRD DRUM BRAKE PEDAL - DOWN TO SET BRAKE - UP TO RELEASE
MEC 3810-287-15/2-14(4)

Figure 2-14 (4).—Continued.

Section V. OPERATION OF EQUIPMENT

2-18. General

a. Instructions in this section are published for information and guidance of personnel responsible for operation of the Lorain crane-shovel.

b. The operator must know how to perform every operation of which the crane-shovel is capable. This section gives instruction on starting and stopping the crane-shovel, basic motions of the crane-shovel, and on coordinating basic motions to perform specific tasks for which the equipment is designed. Since nearly every job presents a different problem, the operator may have to vary given procedures to fit the individual job.

2-19. Starting

a. Preparation for Starting.

(1) Perform necessary daily preventive maintenance services (para 3-6).

(2) Refer to figure 2-14 and disengage the machinery master clutch. Make sure all operating controls are in the neutral position.

b. Starting. Start the engine as instructed on figure 2-15.

2-20. Stopping

a. Stop the crane-shovel as instructed on figure 2-16.

Note. If the crane-shovel is being stopped for overnight or a prolonged period, lower the boom or front end attachment to the ground or on suitable blocking and relieve tension on cables.

b. Place all operating controls in the neutral position, and engage the houselock.

2-21. Operation Under Usual Conditions

a. Operation as a Lifting Crane.

(1) Start the crane-shovel (para 2-19).

(2) Place all operating controls in the neutral position and engage the master clutch (fig. 2-14).

(3) Operate the lifting crane as instructed on figure 2-17.

b. Operation as a Dragline.

(1) Start the crane-shovel (para 2-19).

(2) Place all control levers in the neutral position and engage the master clutch (fig. 2-14).

(3) Operate the dragline as instructed on figure 2-17.

c. Operation as a Clamshell.

(1) Start the crane-shovel (para 2-19).

(2) Place all control levers in the neutral position and engage the master clutch (fig. 2-14).

(3) Operate the clamshell as instructed on figure 2-17.

d. Operation as a Backhoe.

(1) Start the crane-shovel (para 2-19).

(2) Place all control levers in the neutral position and engage the master clutch (fig. 2-14).

(3) Operate the backhoe as instructed on figure 2-17.

e. Operation as a Shovel.

(1) Start the crane-shovel (para 2-19).

(2) Place all control levers in the neutral position and engage the master clutch (fig. 2-14).

(3) Operate the shovel as instructed on figure 2-17.

2-22. Operation in Extreme Cold (Below 0°F)

a. See that antifreeze solution is correct for lowest temperatures expected.

b. Inspect cooling system. Correct or report any leaks.

c. Keep batteries fully charged. After adding water to the batteries, run the engine for at least 1 hour.

d. Keep fuel tank full at all times.

e. Drain and service the fuel filter (para 3-9).

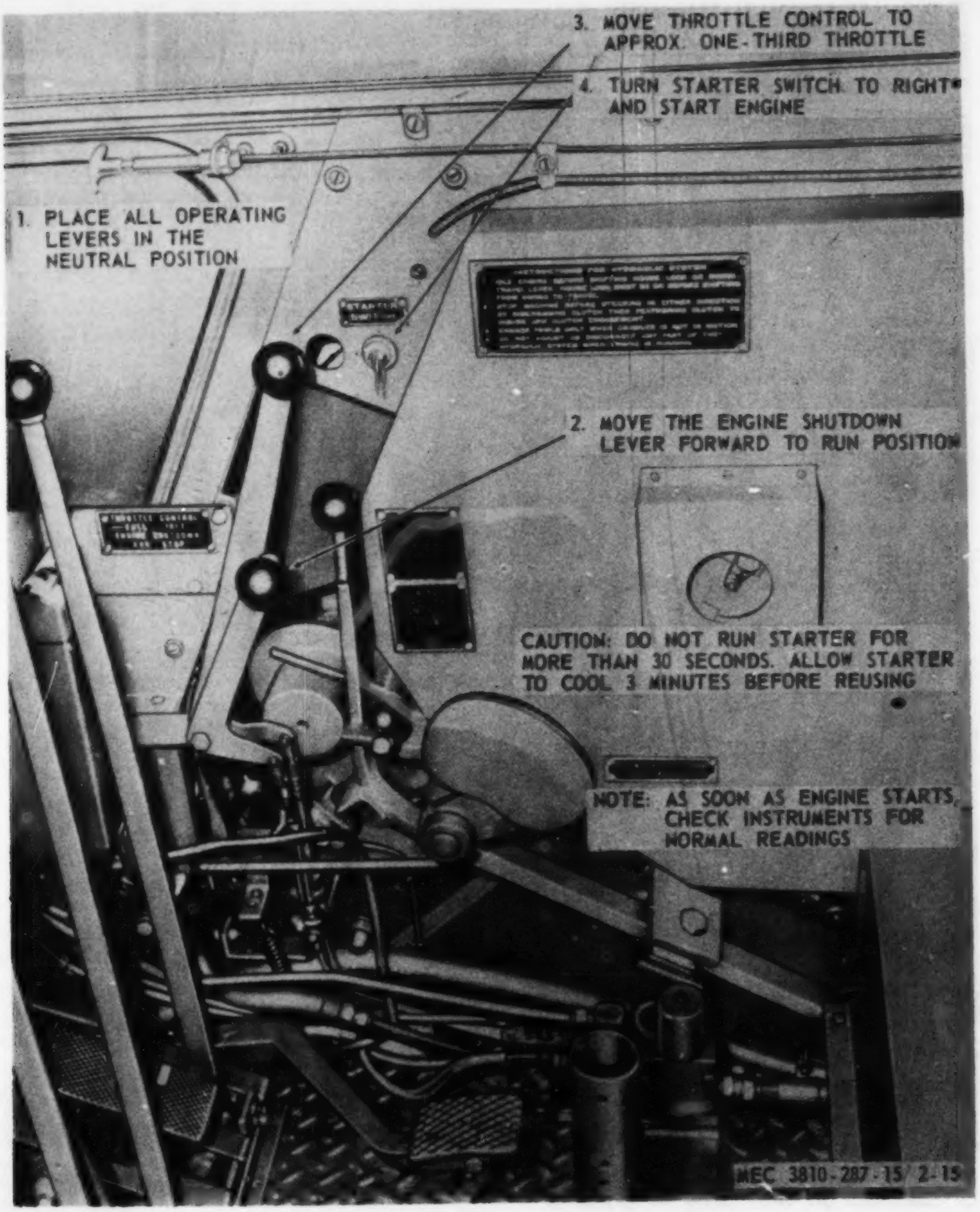
f. Lubricate in accordance with the current lubrication order.

g. Allow engine to reach normal operating temperature before applying load.

2-23. Operation in Extreme Heat

a. Inspect cooling system. Correct or report any leaks.

b. Inspect radiator core for obstruction. Clean as required.



1. PLACE ALL OPERATING LEVERS IN THE NEUTRAL POSITION

2. MOVE THE ENGINE SHUTDOWN LEVER FORWARD TO RUN POSITION

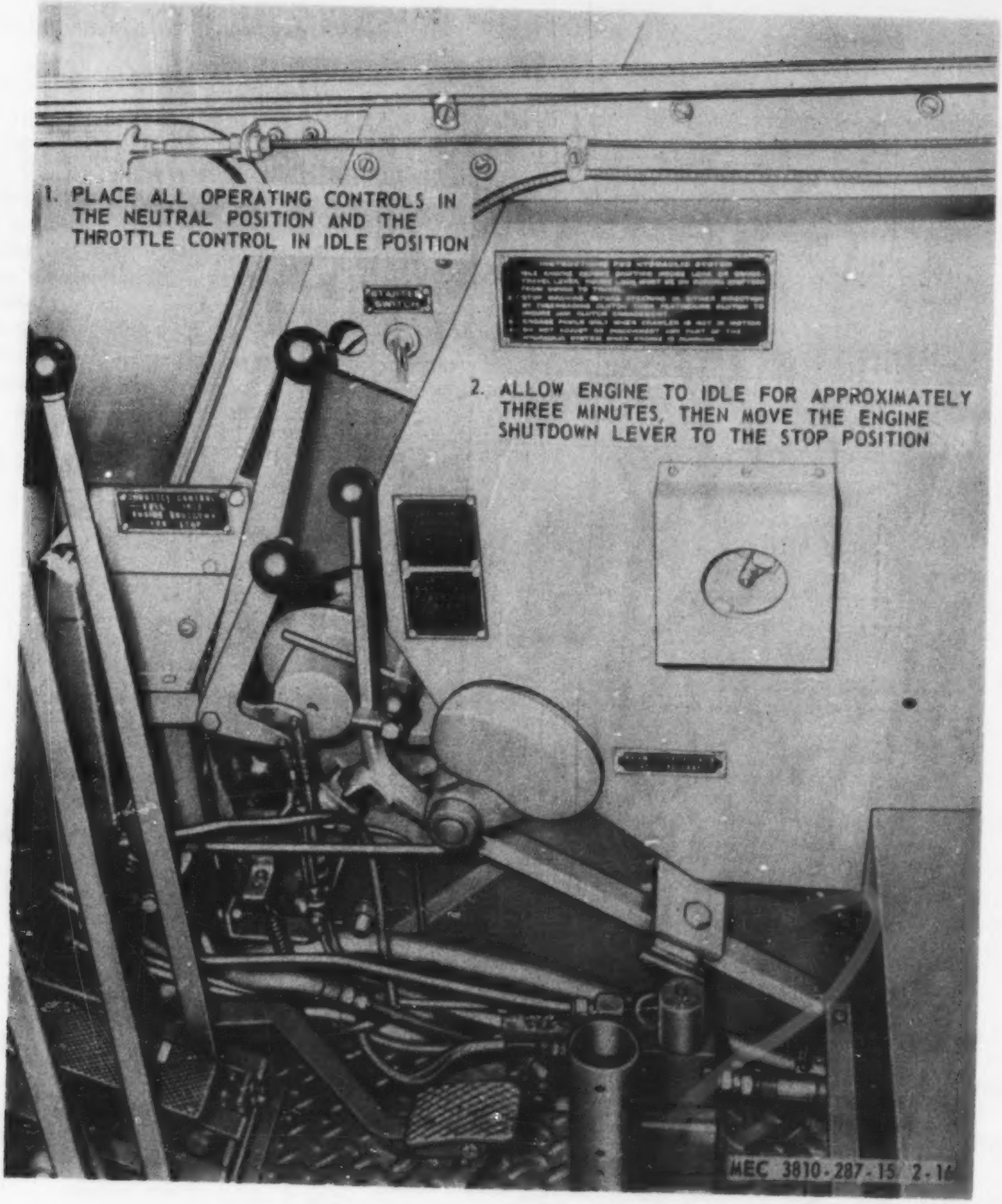
3. MOVE THROTTLE CONTROL TO APPROX. ONE-THIRD THROTTLE

4. TURN STARTER SWITCH TO RIGHT* AND START ENGINE

CAUTION: DO NOT RUN STARTER FOR MORE THAN 30 SECONDS. ALLOW STARTER TO COOL 3 MINUTES BEFORE REUSING

NOTE: AS SOON AS ENGINE STARTS, CHECK INSTRUMENTS FOR NORMAL READINGS

Figure 2-15. Starting the crane-shovel engine.



1. PLACE ALL OPERATING CONTROLS IN THE NEUTRAL POSITION AND THE THROTTLE CONTROL IN IDLE POSITION

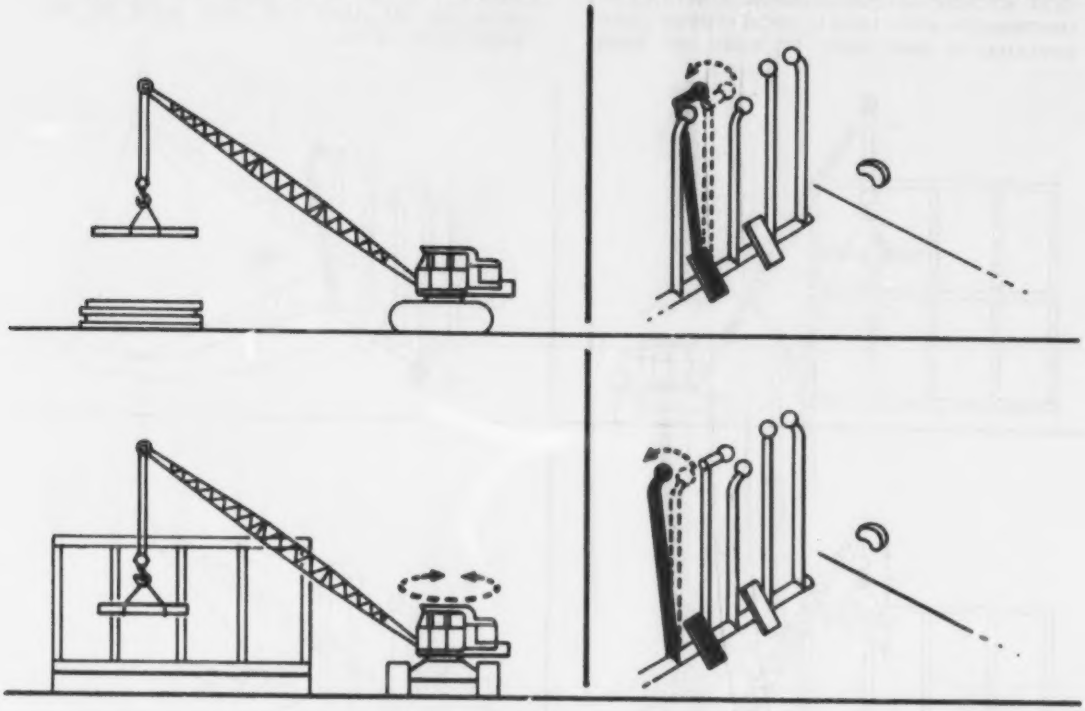
2. ALLOW ENGINE TO IDLE FOR APPROXIMATELY THREE MINUTES, THEN MOVE THE ENGINE SHUTDOWN LEVER TO THE STOP POSITION

STARTER SWITCH
MEC 3810-287-15 2-16

Figure 2-16. Stopping the crane-shovel.

WITH THE HOOK ATTACHED TO THE LOAD, PUSH THE HOIST LEVER FORWARD AND RELEASE THE HOIST BRAKE SIMULTANEOUSLY.

WHEN THE LOAD REACHES THE REQUIRED HEIGHT, DEPRESS THE HOIST BRAKE AND RETURN THE HOIST LEVER TO THE NEUTRAL POSITION.



WITH THE LOAD AT THE REQUIRED HEIGHT, PUSH, OR PULL, THE SWING LEVER TO SWING IN THE REQUIRED DIRECTION. PUSHING THE SWING LEVER FORWARD SWINGS THE MACHINE TO THE RIGHT, PULLING THE LEVER SWINGS THE MACHINE TO THE LEFT.

AS THE LOAD REACHES THE DESIRED POINT, MOVE THE SWING LEVER IN THE OPPOSITE DIRECTION AND ENGAGE THE OPPOSITE SWING CLUTCH LIGHTLY TO STOP THE SWING MOTION.

MEC 3810-287-15/ 2-17 (1)

Figure 2-17 (1). Operation as a lifting crane.

c. Inspect fan belts for proper tension. Adjust as required (para 3-10).

d. Check battery electrolyte level daily. Fill as required.

e. Reduce the interval between lubrication to compensate for loss of lubricant due to high temperatures.

2-24. Operation in Dusty or Sandy Areas

a. Keep all openings closed or protected where possible.

b. Clean lubrication fittings carefully before applying or greasing equipment to prevent dirt penetration into bushings and bearings.

c. Keep lubricant containers tightly sealed.

d. Replace all covers and caps on reservoirs and gear boxes immediately after servicing.

e. If possible, park the crane-shovel in a sheltered area when not in use.

2-25. Operation Under Rainy or Humid Conditions

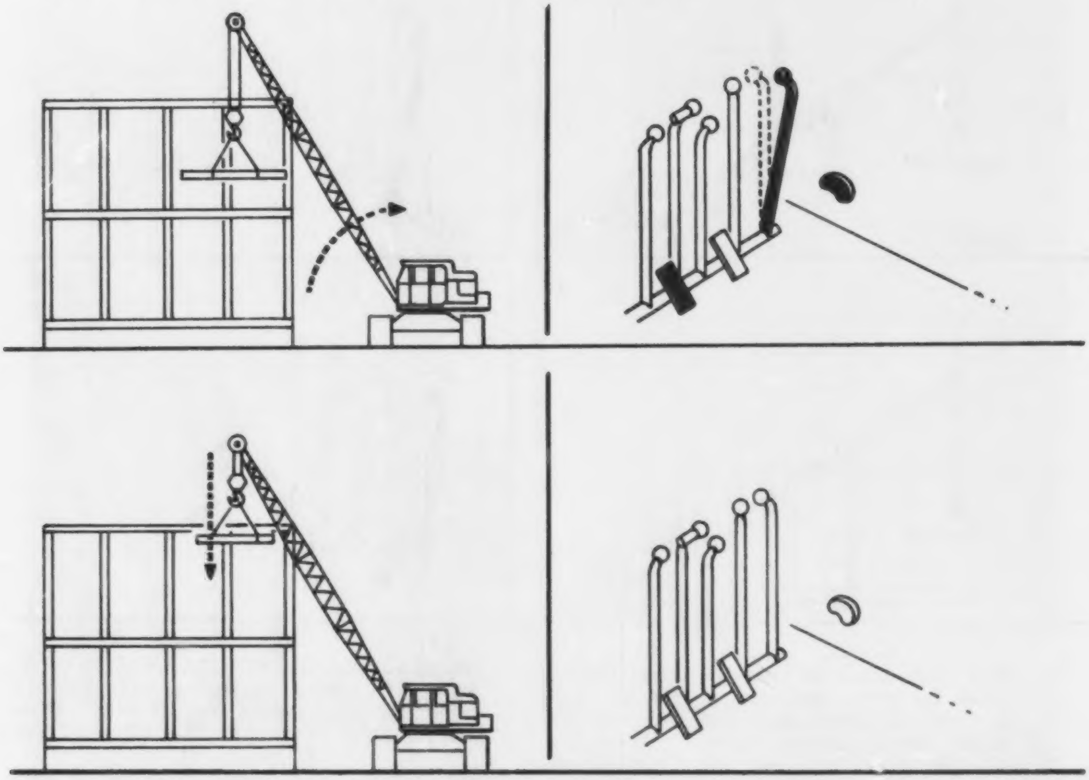
a. Keep all openings closed or protected where possible.

b. Apply a light coat of lubricant to exposed metal surfaces.

c. Drain condensation from fuel tank daily.

d. Drain and service fuel filter frequently (para 3-9).

TO MOVE THE LOAD TOWARD OR AWAY FROM THE MACHINE REQUIRES BOOM HOISTING OR LOWERING. SHIFT LEVER FROM POWER LOAD LOWERING TO BOOM HOIST. TO RAISE THE BOOM, PUSH THE BOOM HOIST LEVER FORWARD. TO LOWER. THE BOOM, MOVE THE BOOM SAFETY LOCK TO THE REAR AND PULL BACK ON THE BOOM HOIST LEVER.



TO LOWER THE LOAD, RELEASE THE HOIST BRAKE SLIGHTLY.

CONTROL THE LOAD LOWERING SPEED BY PRESSURE ON THE BRAKE.

MEC 3810-287-15/ 2-17 (2)

Figure 2-17 (2)—Continued.

2-26. Operation in Salt Water Areas

a. Keep all exposed metal surfaces coated with lubricant.

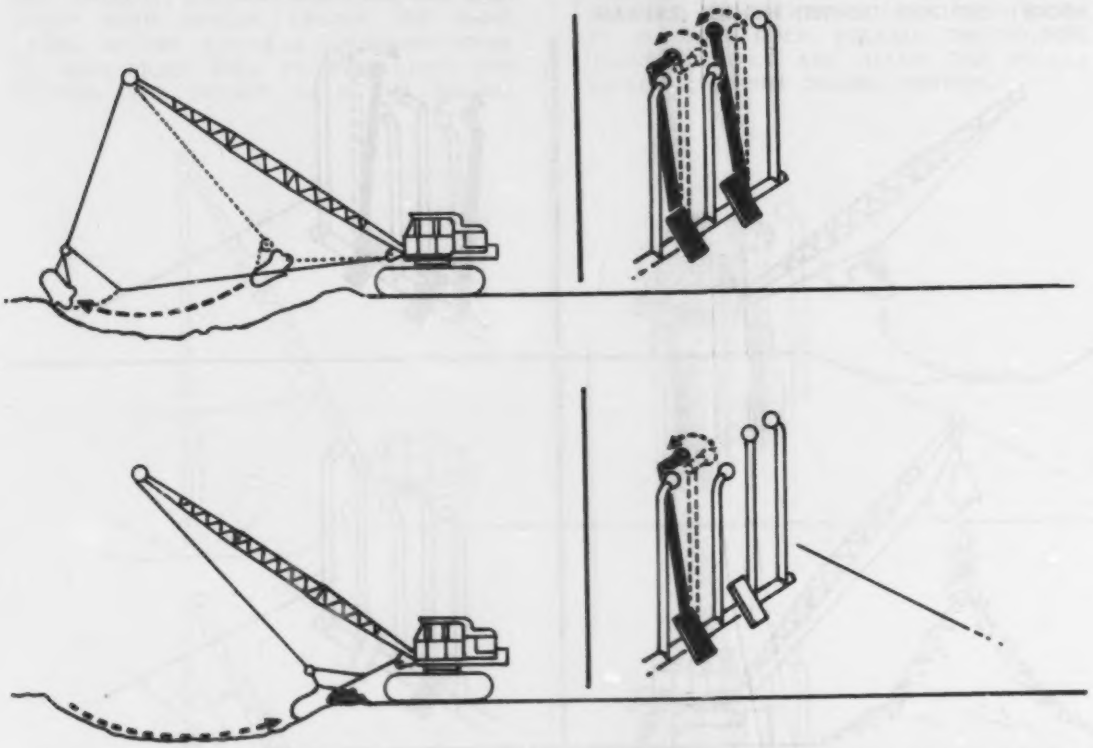
b. Keep paint in good condition. Repaint damaged areas immediately.

c. Increase lubrication interval to compensate for salt water corrosive action.

2-27. Operation at High Altitude

a. Operation of the crane-shovel at high altitude will be affected only by the reduction of power delivered by the engine. This is normally not severe enough to seriously reduce the efficiency of the machine.

b. To assure maximum performance at high altitude, service the air cleaner frequently to obtain maximum volume of air intake.



PUSH FORWARD ON THE HOIST LEVER AND RELEASE THE HOIST BRAKE, RAISE THE BUCKET UNTIL THE CHAINS ARE CLEAR OF THE GROUND.

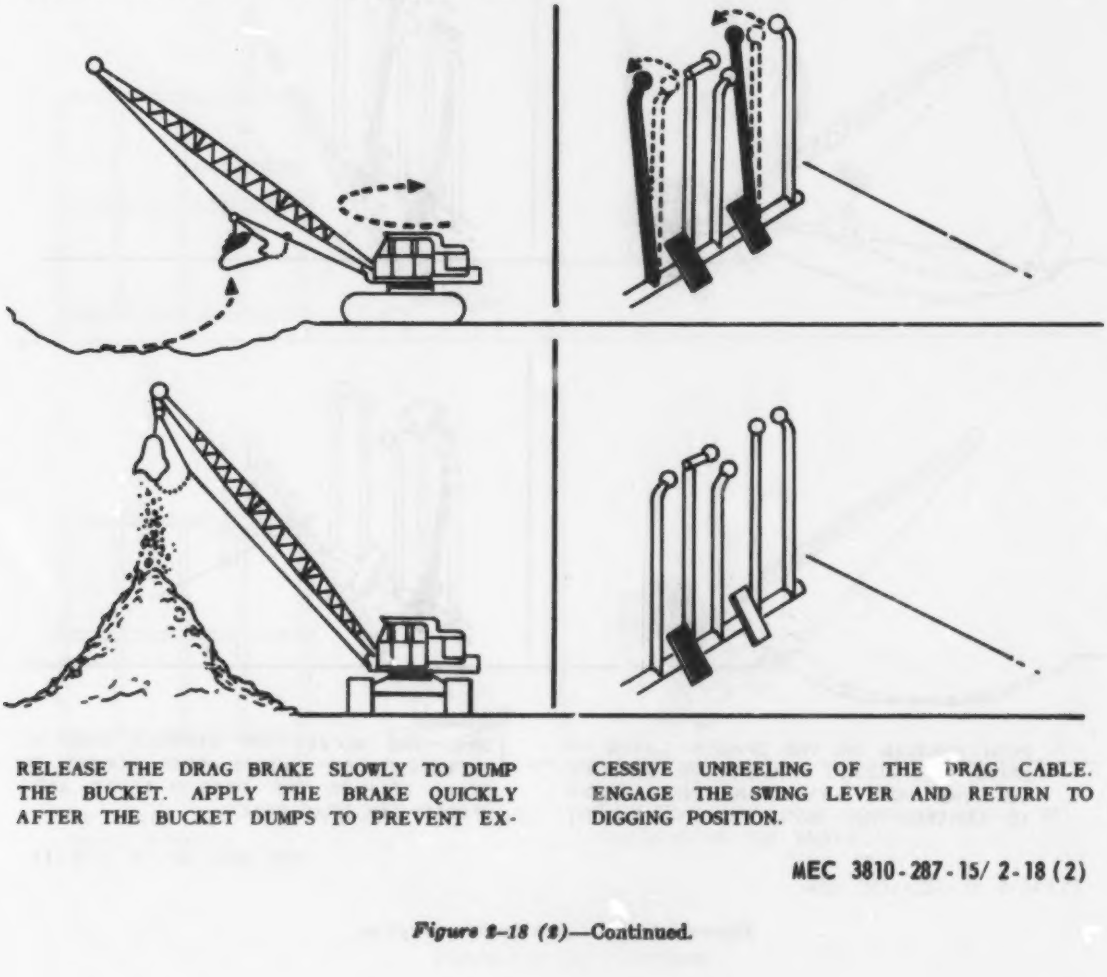
RELEASE THE HOIST LEVER AND APPLY THE HOIST BRAKE. SWING THE BUCKET TO DIGGING POSITION AND LOWER IT TO THE GROUND.

PUSH FORWARD ON THE DRAG-IN LEVER TO BRING THE BUCKET TOWARD THE MACHINE. USE THE HOIST LEVER AND HOIST BRAKE TO CONTROL THE DEPTH OF CUT. DO NOT DRAG THE BUCKET ANY FURTHER THAN IS NECESSARY FOR FILLING. WHEN BUCKET IS FULL, RELEASE THE DRAG-IN LEVER AND DEPRESS THE DRAG BRAKE.

MEC 3810-287-15/2-18 (1)

Figure 2-18 (1). Operation as a dragline.

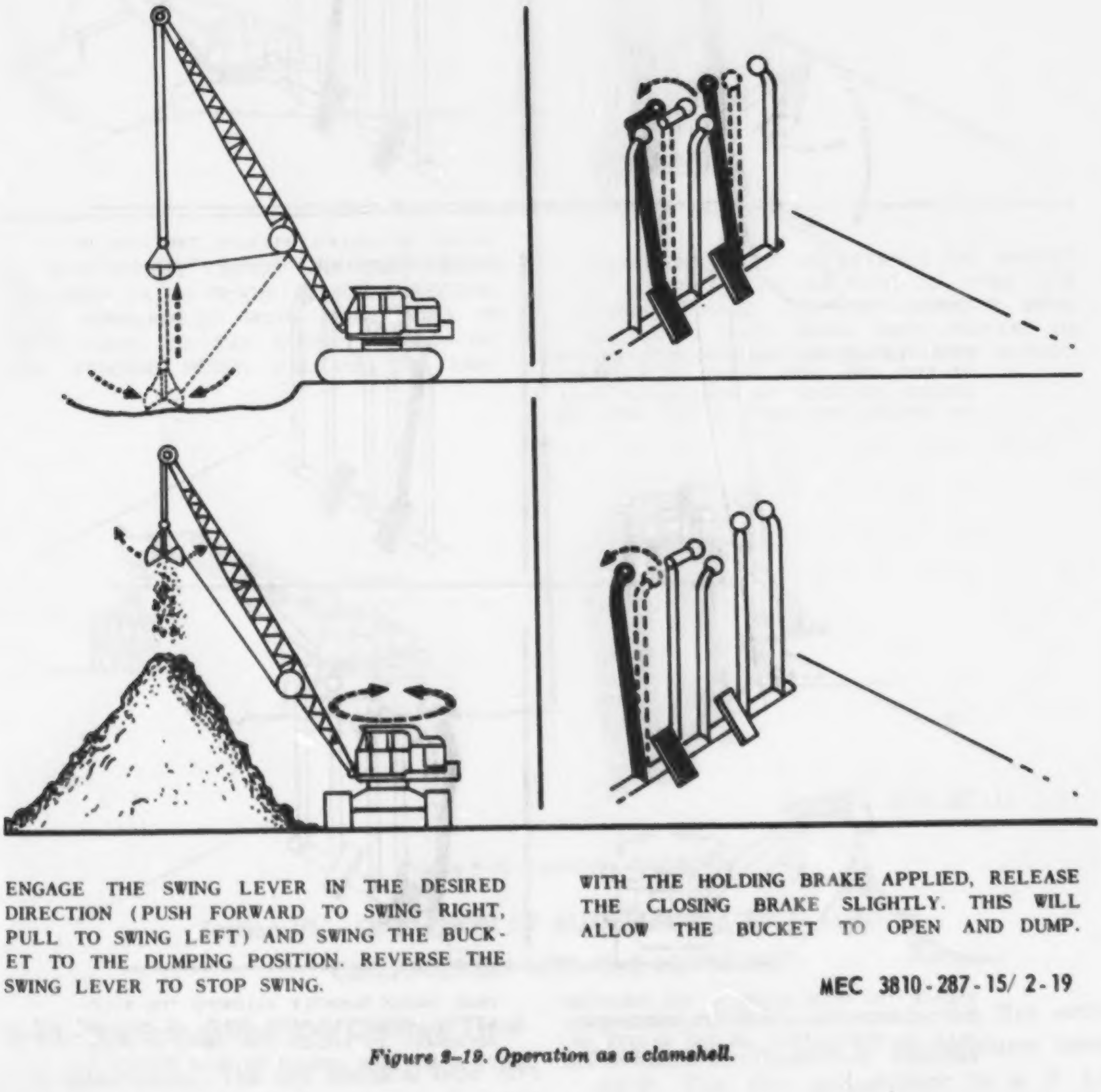
PUSH FORWARD ON THE HOIST LEVER AND RELEASE THE HOIST BRAKE. MAINTAIN JUST ENOUGH PRESSURE ON THE DRAG BRAKE TO PREVENT THE BUCKET FROM DUMPING. WHEN BUCKET REACHES DESIRED HEIGHT, RELEASE THE HOIST LEVER AND APPLY BOTH BRAKES. ENGAGE THE SWING LEVER IN REQUIRED DIRECTION (PUSH LEVER FOR RIGHT SWING, PULL FOR LEFT SWING).



RELEASE THE DRAG BRAKE SLOWLY TO DUMP THE BUCKET. APPLY THE BRAKE QUICKLY AFTER THE BUCKET DUMPS TO PREVENT EXCESSIVE UNREELING OF THE DRAG CABLE. ENGAGE THE SWING LEVER AND RETURN TO DIGGING POSITION.

MEC 3810-287-15/ 2-18 (2)

Figure 2-18 (2)—Continued.



PUSH FORWARD ON BOTH THE HOLDING AND CLOSING LEVERS AND RELEASE BOTH BRAKE PEDALS. WHEN THE BUCKET IS CLEAR OF THE GROUND, RELEASE BOTH LEVERS AND APPLY BOTH BRAKES. ENGAGE THE SWING LEVER IN THE REQUIRED DIRECTION (PUSH TO SWING RIGHT, PULL TO SWING LEFT) AND POSITION THE BUCKET OVER THE DIGGING POSITION. IT MAY BE NECESSARY TO BOOM UP OR DOWN TO CORRECTLY POSITION THE BUCKET.

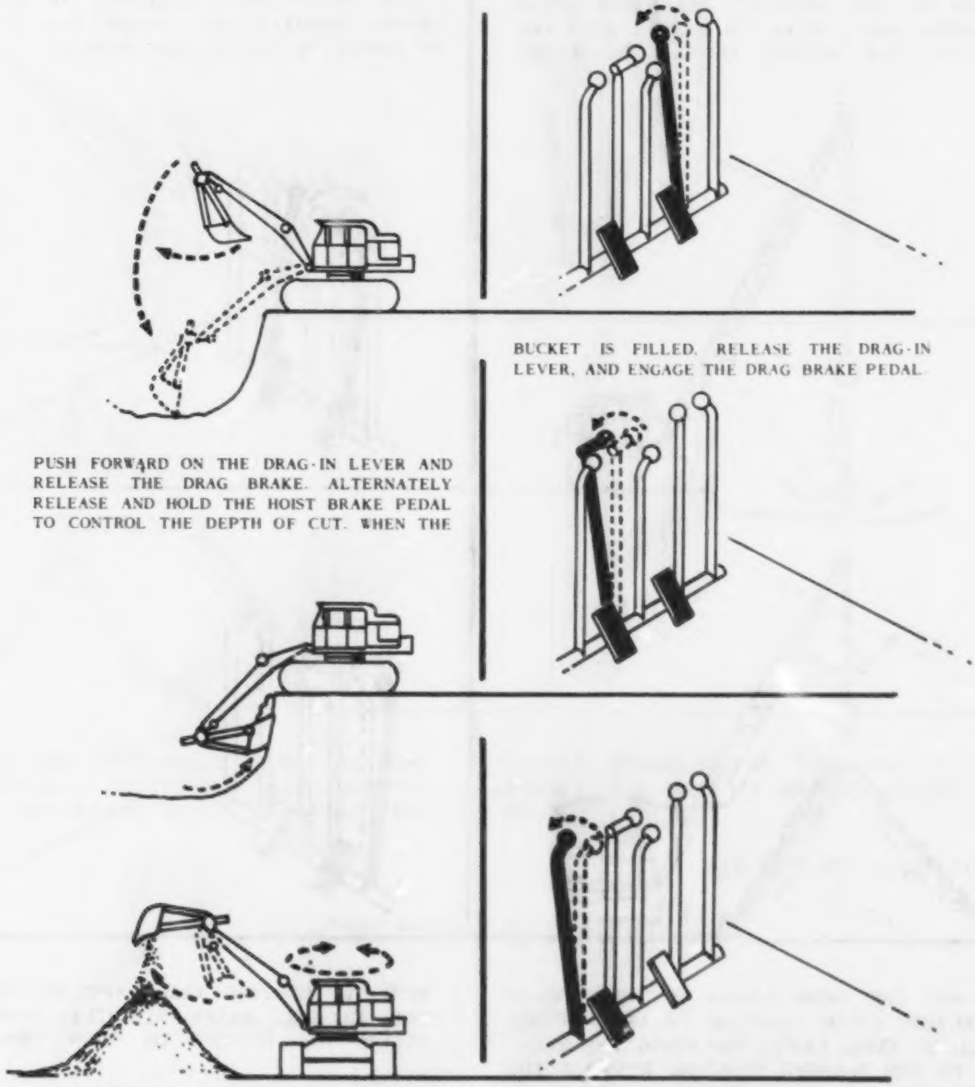
RELEASE THE CLOSING BRAKE SLIGHTLY, ALLOWING THE BUCKET TO OPEN. WHEN BUCKET IS FULLY OPEN, RELEASE THE HOLDING BRAKE SLIGHTLY AND ALLOW THE BUCKET TO LOWER TO THE DIGGING POSITION.

ENGAGE THE SWING LEVER IN THE DESIRED DIRECTION (PUSH FORWARD TO SWING RIGHT, PULL TO SWING LEFT) AND SWING THE BUCKET TO THE DUMPING POSITION. REVERSE THE SWING LEVER TO STOP SWING.

WITH THE HOLDING BRAKE APPLIED, RELEASE THE CLOSING BRAKE SLIGHTLY. THIS WILL ALLOW THE BUCKET TO OPEN AND DUMP.

MEC 3810-287-15/2-19

Figure 2-19. Operation as a clamshell.



PUSH FORWARD ON THE HOIST LEVER AND RELEASE THE HOIST BRAKE. AS THE BACKHOE BOOM RAISES, RELEASE THE DRAG BRAKE PEDAL SLIGHTLY ALLOWING THE BUCKET TO MOVE OUTWARD. RELEASE THE HOIST LEVER AND APPLY BOTH BRAKES.

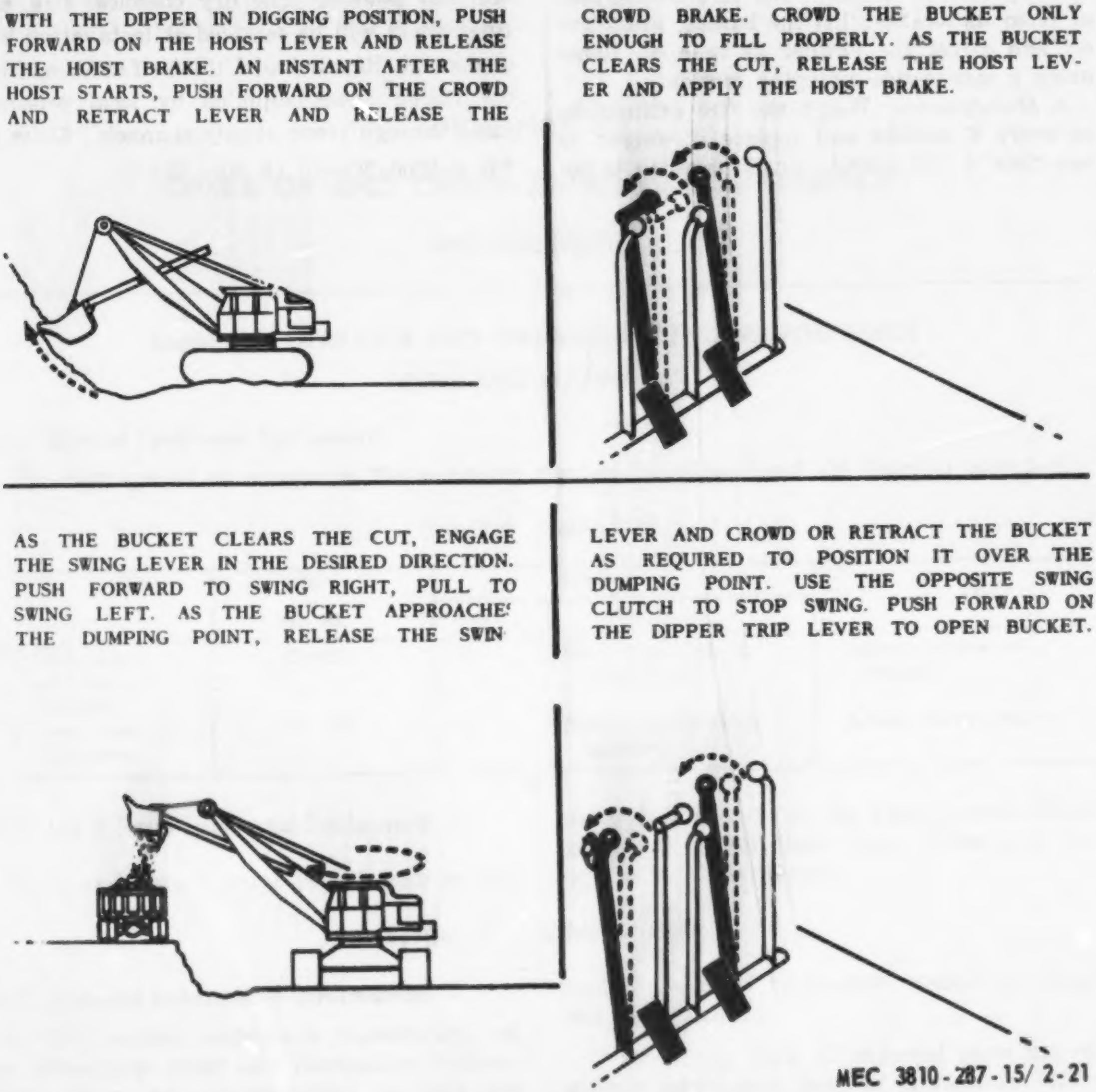
ENGAGE THE SWING LEVER IN THE REQUIRED DIRECTION (PUSH LEVER TO SWING RIGHT, PULL TO SWING LEFT) TO POSITION THE BUCKET OVER THE DIGGING AREA. RELEASE THE HOIST BRAKE PEDAL SLIGHTLY AND ALLOW THE BUCKET TO LOWER TO THE GROUND.

PUSH FORWARD ON THE DRAG-IN LEVER AND RELEASE THE DRAG BRAKE. ALTERNATELY RELEASE AND HOLD THE HOIST BRAKE PEDAL TO CONTROL THE DEPTH OF CUT. WHEN THE BUCKET IS FILLED, RELEASE THE DRAG-IN LEVER, AND ENGAGE THE DRAG BRAKE PEDAL.

ENGAGE THE SWING LEVER IN THE DIRECTION OF THE SPOIL PILE (PUSH TO SWING RIGHT, PULL TO SWING LEFT). AS THE BUCKET APPROACHES THE SPOIL PILE RELEASE THE DRAG BRAKE SLIGHTLY ALLOWING THE BUCKET TO SWING OUT AND DUMP. IT MAY BE NECESSARY TO ENGAGE THE HOIST IF BUCKET IS NOT HIGH ENOUGH TO DUMP PROPERLY.

MEC 3810-287-15/2-20

Figure 2-20. Operation as a backhoe.



WITH THE DIPPER IN DIGGING POSITION, PUSH FORWARD ON THE HOIST LEVER AND RELEASE THE HOIST BRAKE. AN INSTANT AFTER THE HOIST STARTS, PUSH FORWARD ON THE CROWD AND RETRACT LEVER AND RELEASE THE CROWD BRAKE. CROWD THE BUCKET ONLY ENOUGH TO FILL PROPERLY. AS THE BUCKET CLEARS THE CUT, RELEASE THE HOIST LEVER AND APPLY THE HOIST BRAKE.

AS THE BUCKET CLEARS THE CUT, ENGAGE THE SWING LEVER IN THE DESIRED DIRECTION. PUSH FORWARD TO SWING RIGHT, PULL TO SWING LEFT. AS THE BUCKET APPROACHE THE DUMPING POINT, RELEASE THE SWIN LEVER AND CROWD OR RETRACT THE BUCKET AS REQUIRED TO POSITION IT OVER THE DUMPING POINT. USE THE OPPOSITE SWING CLUTCH TO STOP SWING. PUSH FORWARD ON THE DIPPER TRIP LEVER TO OPEN BUCKET.

Figure 2-21. Operation as a shovel

Section VI. OPERATION OF AUXILIARY MATERIAL USED IN CONJUNCTION WITH THE EQUPMENT

2-28. Fire Extinguisher (Dry Chemical Type)

a. Description. The dry chemical type fire extinguisher is suitable for use on all types of fire and is effective in areas where ambient temperature is -25°F and above. If winterized (pressurized with nitrogen), the fire extinguisher may be used in temperatures below -25°F. The fire extinguisher is a 2 1/2 pound, stored-pressure, lever-operated extinguisher.

b. Operation. Remove the fire extinguisher from its location, lift the handle, press lever, and direct the powder at base of flame using a side-to-side sweeping motion.

c. Maintenance. Weigh the fire extinguisher every 6 months and replace if weight is less than 4 1/2 pounds, or if pressure is below 125 pounds. The dry chemical fire extinguishers will be serviced at installation level through Repair and Utilities facilities, with the filling agent supplied by local procurement through troop supply channels. Refer to TB 5-4200-200-10 (5 May 65).

CHAPTER 3

OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. OPERATOR AND ORGANIZATIONAL MAINTENANCE TOOLS AND EQUIPMENT

3-1. Special Tools and Equipment

The only special tools required for servicing the Lorain crane-shovel are listed in table 3-1.

Table 3-1. Special Tools

Item	FSN or Part No.	Reference		Use
		Figure	Paragraph	
Wrench, clutch and brake adjustment.	D-6383	1	Basic issue items list appendix B.	Adjust clutches and brakes.
Wrench, track adjustment.	E-2128	1	Basic issue items list appendix B.	Adjust crawler tracks.

3-2. Basic Issue Tools and Equipment

Tools and repair parts issued with or authorized for use with the Lorain crane-shovel are listed in the Basic Issue Items List, appendix B of this manual.

Section II. LUBRICATION

3-3. General Lubrication Information

a. This section contains a reproduction of the lubrication order and lubrication instructions which are supplemental to, and not specifically covered in the lubrication order.

b. The lubrication order shown in figure 3-1 is an exact reproduction of the approved lubrication order for the Lorain crane-shovel. For the current lubrication order, refer to DA PAM 310-4.

3-4. Detailed Lubrication Instructions

a. General. Keep all lubricants in closed containers and stored in a clean dry place away from external heat. Allow no dust, dirt, or other foreign material to mix with the lubricants. Keep all lubrication equipment clean and ready for use.

b. Cleaning. Keep all external parts not requiring lubrication clean of lubricants. Before lubricating the equipment, wipe all lubrication points free of dirt and grease. Clean all lubrication points after lubricating to prevent accumulation of foreign matter.

c. Points of Lubrication. Service the lubrication points at proper intervals as illustrated in figure 3-1.

d. OES Oil.

(1) Crankcase oil level must be checked frequently, as oil consumption may increase.

(2) Oil may require changing more frequently than usual because contamination by dilution and sludge formation will increase under cold weather operation conditions.

e. Engine Crankcase and Oil Filter Service. Refer to figure 3-2 and service the engine crankcase and oil filter.

f. Air Cleaner Service. Refer to figure 3-3 and service the air cleaner.

g. Drip Oiler Service. Refer to figure 3-4 and service the drip oiler.

h. Hydraulic Reservoir and Filter Service. Refer to figure 3-5 and service the hydraulic reservoir and filter.

i. Shear-Ball Race Service. The shear-ball race requires a special lubricant and must not be lubricated with standard lubricants. The shear-ball lubrication points are located to the right of the operator's seat and identified by button-head fittings. Refer to the lubrication chart and use only the lubricant designated.

LUBRICATION CHART

CRANE-SHOVEL, CRAWLER MOUNTED, 12½ TON
¾ CU. YD; DIESEL ENGINE (LORAIN MODEL
L 36M) W/ENGINE DETROIT DIESEL
MODEL 3055C

REFERENCE C9100-1L

Intervals are based on normal hours of operations. Adjust to compensate for abnormal operations and severe conditions. During inactive periods, sufficient lubrication must be performed for adequate preservation.

Clean fittings before lubricating.

Relubricate after washing or fording.

A dotted circle indicates a drain below.

Clean parts with SOLVENT, dry-cleaning, or with OIL, fuel, Diesel. Dry before lubricating.

Lubricate points indicated by dotted arrow shafts on both sides of equipment.

Drain transmission when hot. Fill and check level.

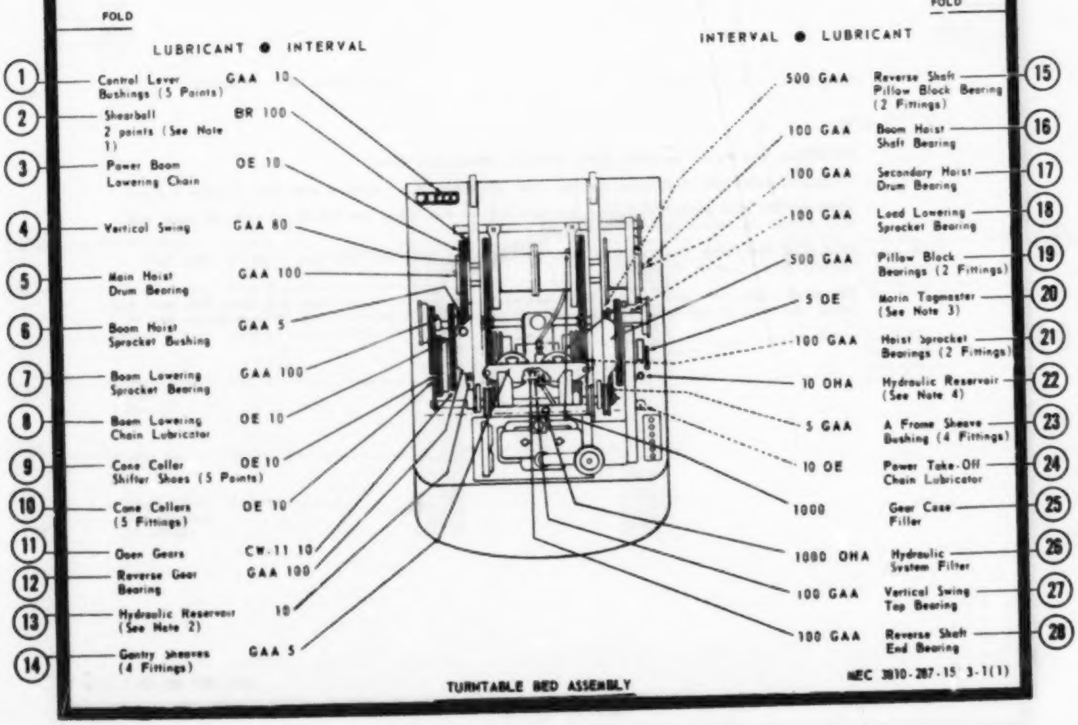

FOLD
LUBRICANT ● INTERVAL
① Control Lever Bushings (5 Points) GAA 10
② Shearball 2 points (See Note 1) BR 100
③ Power Boom Lowering Chain OE 10
④ Vertical Swing GAA 80
⑤ Main Hoist Drum Bearing GAA 100
⑥ Boom Hoist Sprocket Bushing GAA 5
⑦ Boom Lowering Sprocket Bearing GAA 100
⑧ Boom Lowering Chain Lubricator OE 10
⑨ Cone Collar Shifter Shoes (5 Points) OE 10
⑩ Cone Collars (5 Fittings) OE 10
⑪ Open Gears CW-11 10
⑫ Reverse Gear Bearing GAA 100
⑬ Hydraulic Reservoir (See Note 2) 10
⑭ Gantry Sheaves (4 Fittings) GAA 5
FOLD
INTERVAL ● LUBRICANT
500 GAA Reverse Shaft Pillow Block Bearing (2 Fittings) ⑮
100 GAA Boom Hoist Shaft Bearing ⑯
100 GAA Secondary Hoist Drum Bearing ⑰
100 GAA Load Lowering Sprocket Bearing ⑱
500 GAA Pillow Block Bearings (2 Fittings) ⑲
5 OE Morin Tagmaster (See Note 3) ⑳
100 GAA Hoist Sprocket Bearings (2 Fittings) ㉑
10 OHA Hydraulic Reservoir (See Note 4) ㉒
5 GAA A Frame Sheave Bushing (4 Fittings) ㉓
10 OE Power Take-Off Chain Lubricator ㉔
1000 Gear Case Filler ㉕
1000 OHA Hydraulic System Filter ㉖
100 GAA Vertical Swing Top Bearing ㉗
100 GAA Reverse Shaft End Bearing ㉘
TURNTABLE BED ASSEMBLY
MEC 3810-287-15 3-1(1)

Figure 3-1 (1). Lubrication chart.

• KEY •

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above -32° F	40°F To -10°F	0°F To -65°F	
OE - OIL, Engine, Heavy Duty Oil can points OES - OIL, Engine, Sub-zero		OE 30	OE 10	OES	
GO - LUBRICATING OIL, Gear Deck gears	6 gal	GO 90	GO 90	GOS	Intervals given are in hours of normal operation
GOS - LUBRICATING OIL, Gear, Sub-zero					
CW-11 LUBRICATING OIL, Exposed Gear GAA - GREASE, Automotive and Artillery					
OHA - HYDRAULIC FLUID, Petroleum Hydraulic Reservoir (Main)	10 gal	ALL TEMPERATURES			
OHA - HYDRAULIC FLUID, Petroleum Hydraulic Reservoir (Manual Hydraulic Controls)	1 pint	ALL TEMPERATURES			

FOLD FOLD

NOTES:

1. **SHEARBALL.** Use one gun of grease equally distributed between each fitting.
2. **HYDRAULIC RESERVOIR.** Check daily and keep filled with Wagner 21 or equivalent brake fluid. Capacity – 1 pint.
3. **MORIN DIPPER TRIP ASSEMBLY.** Remove screw plug and fill drum oiltube with SAE-20 oil every 100 hours. Soak thrust washers and between cams with SAE 20 oil every 5 hours.
4. **HYDRAULIC RESERVOIR.** Check oil level daily. Drain, flush and refill every 1000 hours (Type "A" Suffix "A" Hydraulic Fluid) Capacity: 12 gallons.
5. **TOP GEAR CASE.** Check daily and add oil to maintain level at mark on magnetic filler plug. Every 1000 hours drain through pipe outlet at right hand side of turntable bed and refill with 6 gallons of SAE-140 multi-purpose gear oil.

MEC 3810-287-15/3-1(2)

Figure 3–1 (2).—Continued.

LUBRICATION CHART

CRANE-SHOVEL, CRAWLER MOUNTED, 12½ TON ¾ CU. YD; DIESEL ENGINE (LORAIN MODEL L 36M) W/ENGINE DETROIT DIESEL MODEL 3055C

REFERENCE: 9100-IL

Intervals are based on normal hours of operations. Adjust to compensate for abnormal operations and severe conditions. During inactive periods, sufficient lubrication must be performed for adequate preservation.

Clean fittings before lubricating.

Relubricate after washing or fording.

A dotted circle indicates a drain below.

Clean parts with SOLVENT, dry-cleaning, or with OIL, fuel, Diesel, Dry before lubricating.

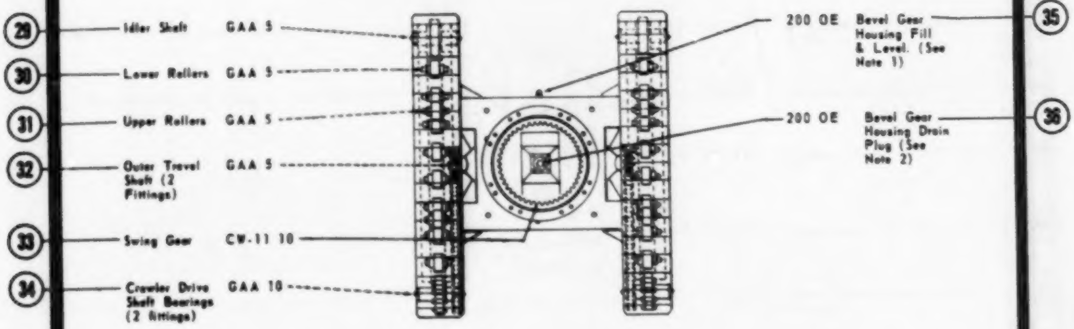
Lubricate points indicated by dotted arrow shafts on both sides of equipment.

FOLD

FOLD

LUBRICANT ● INTERVAL

INTERVAL ● LUBRICANT


㉙ Idler Shaft GAA 5
㉚ Lower Rollers GAA 5
㉛ Upper Rollers GAA 5
㉜ Outer Travel Shaft (2 Fittings) GAA 5
㉝ Swing Gear CW-11 10
㉞ Crawler Drive Shaft Bearings (2 fittings) GAA 10
200 OE Bevel Gear Housing Fill & Level. (See Note 1) ㉟
200 OE Bevel Gear Housing Drain Plug (See Note 2) ㊱

CRAWLER ASSEMBLY

MEC 3810-287-15/3-1(3)

Figure 3-1 (3).—Continued.

-KEY-

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above -32°F.	40°F. To -10°F.	0°F. To -65°F.	
GO - LUBRICATING OIL, Gear Crawler gear case GOS - LUBRICATING OIL, Gear Sub-zero	7-1/2 gal.	GO 90	GO 90	GOS	Intervals given are in hours of normal operation
GAA - GREASE, Automotive and Artillery		ALL TEMPERATURES			
CW-11 LUBRICATING OIL, Exposed gear		ALL TEMPERATURES			

NOTES.

1. BEVEL GEAR HOUSING. Check oil level daily, fill to level plug.
2. BEVEL GEAR HOUSING. Drain, flush and refill every 1000 hours. Capacity: 7-1/2 gallons.

FOLD

FOLD

MEC 3810-287-15/3-1(4)

Figure 3- 1(4).—Continued.

LUBRICATION CHART

CRANE-SHOVEL, CRAWLER MOUNTED, 12½ TON ¾ CU. YD; DIESEL ENGINE (LORAIN MODEL L 36M) W/ENGINE DETROIT DIESEL MODEL 3055C

REFERENCE: C9100-IL

Intervals are based on normal hours of operations. Adjust to compensate for abnormal operations and severe conditions. During inactive periods, sufficient lubrication must be performed for adequate preservation.

Clean fittings before lubricating.

Relubricate after washing or fording.

A dotted circle indicates a drain below.

Clean parts with SOLVENT, dry-cleaning, or with OIL, fuel, Diesel. Dry before lubricating.

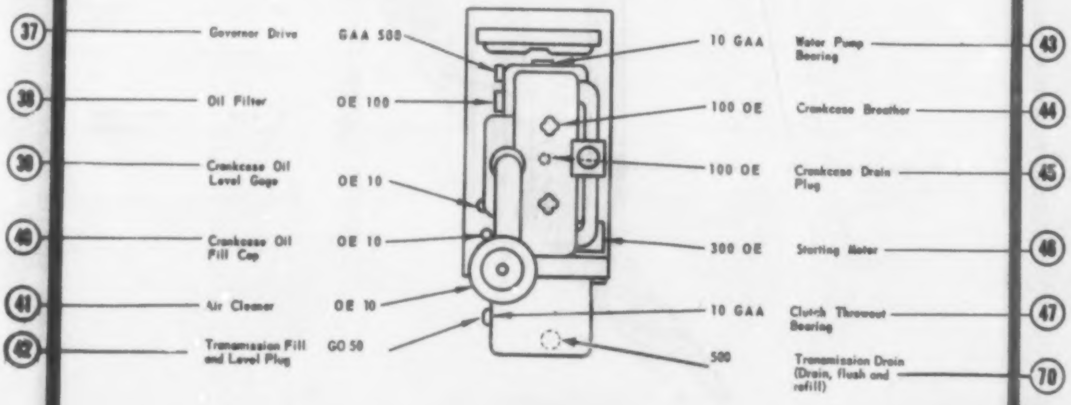
Lubricate points indicated by dotted arrow shafts on both sides of equipment.

FOLD

FOLD

LUBRICANT● INTERVAL

INTERVAL● LUBRICANT



(37)
Governor Drive
GAA 500
(38)
Oil Filter
OE 100
(39)
Crankcase Oil Level Gage
OE 10
(40)
Crankcase Oil Fill Cap
OE 10
(41)
Air Cleaner
OE 10
(42)
Transmission Fill and Level Plug
GO 50
10 GAA
Water Pump Bearing
(43)
100 OE
Crankcase Breather
(44)
100 OE
Crankcase Drain Plug
(45)
300 OE
Starting Motor
(46)
10 GAA
Clutch Throwout Bearing
(47)
500
Transmission Drain (Drain, flush and refill)
(70)

ENGINE ASSEMBLY

MEC 3810-287-15/3-1(5)

Figure 3-1 (5).—Continued.

-KEY-

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above +32°F.	40°F To -10°F	0°F To -65°F	
OE - OIL, Heavy Duty Engine Crankcase Oil Can Points OES - OIL Engine, sub-zero.	13 qts.	OE 30	OE 10	OES	Intervals given are in hours of normal operation
GO - LUBRICATING OIL - Gear Transmission GOS - LUBRICATING OIL, Gear, sub-zero	3 pts.	GO 90	GO 90	GOS	
GAA - GREASE - Automotive and Artillery		ALL TEMPERATURES			

NOTES:

1. TRANSMISSION. Check level every 50 hours. Every 1000 hrs., drain, flush and refill. Capacity - 3 pints.

FOLD

FOLD

MEC 3810-287-15/3-1(6)

Figure 3-1 (6).—Continued.

LUBRICATION CHART

CRANE-SHOVEL, CRAWLER MOUNTED, 12½ TON ¾ CU. YD; DIESEL ENGINE (LORAIN MODEL L36M) W/ENGINE DETROIT DIESEL MODEL 3055C

REFERENCE: C9100-IL

Intervals are based on normal hours of operations. Adjust to compensate for abnormal operations and severe conditions. During inactive periods, sufficient lubrication must be performed for adequate preservation.

Clean fittings before lubricating.

Relubricate after washing or fording.

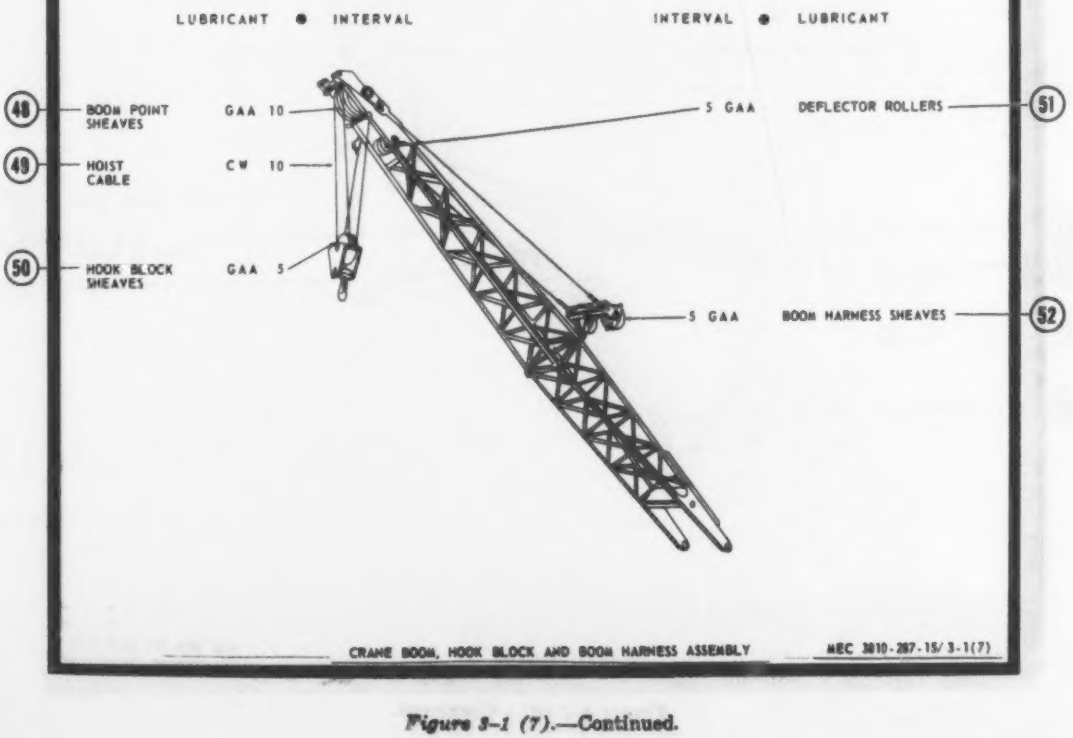
A dotted circle indicates a drain below.

Clean parts with SOLVENT, dry-cleaning, or with OIL, fuel, Diesel. Dry before lubricating.

Lubricate points indicated by dotted arrow shafts on both sides of equipment.

FOLD

FOLD


LUBRICANT ● INTERVAL
INTERVAL ● LUBRICANT
(48) BOOM POINT SHEAVES GAA 10
(49) HOIST CABLE CW 10
(50) HOOK BLOCK SHEAVES GAA 5
5 GAA DEFLECTOR ROLLERS (51)
5 GAA BOOM HARNESS SHEAVES (52)

CRANE BOOM, HOOK BLOCK AND BOOM HARNESS ASSEMBLY

MEC 3810-287-15/3-1(7)

Figure 3-1 (7).—Continued.

-KEY-

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above-32°F.	40°F. To -10°F.	0°F To -65°F.	
CW-11 LUBRICATING OIL - Exposed gear		ALL TEMPERATURES			Intervals given are in hours of normal operation
GAA - GREASE, Automotive and Artillery		ALL TEMPERATURES			

FOLD

FOLD

MEC 3810-287-15/3-1(8)

Figure 3-1 (8).—Continued.

LUBRICATION CHART

CRANE-SHOVEL, CRAWLER MOUNTED, 12½ TON ¾ CU. YD; DIESEL ENGINE (LORAIN MODEL L36M) W/ENGINE DETROIT DIESEL MODEL 3055C

REFERENCE: C9100-IL

Intervals are based on normal hours of operations. Adjust to compensate for abnormal operations and severe conditions. During inactive periods, sufficient lubrication must be performed for adequate preservation.

Clean fittings before lubricating.

Relubricate after washing or fording.

A dotted circle indicates a drain below.

Clean parts with SOLVENT, dry-cleaning, or with OIL, fuel, Diesel. Dry before lubricating.

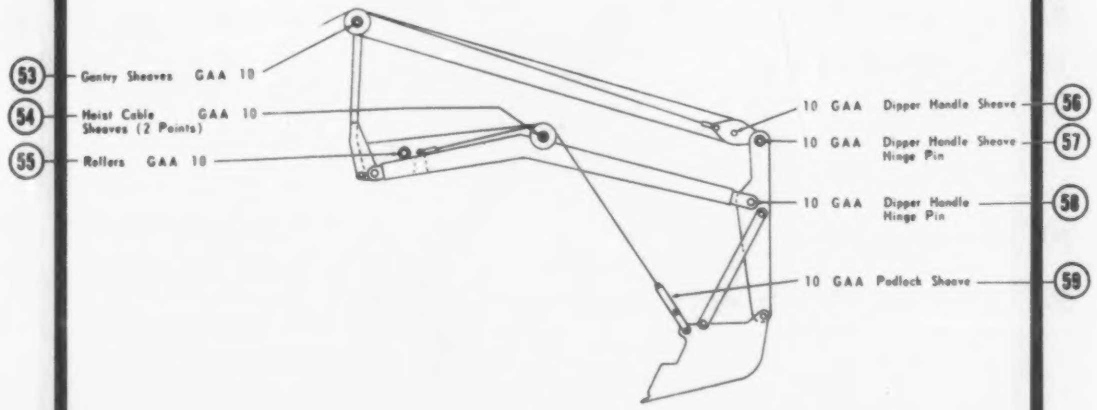
Lubricate points indicated by dotted arrow shafts on both sides of equipment.

FOLD

FOLD

LUBRICANT ● INTERVAL

INTERVAL ● LUBRICANT


53
Gantry Sheaves GAA 10
54
Hoist Cable Sheaves (2 Points) GAA 10
55
Rollers GAA 10
10 GAA Dipper Handle Sheave
56
10 GAA Dipper Handle Sheave Hinge Pin
57
10 GAA Dipper Handle Hinge Pin
58
10 GAA Padlock Sheave
59

BACK HOE BOOM ASSEMBLY

MEC 3810-287-15/3-1(9)

Figure 3-1 (9).—Continued.

-KEY-

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above +32°F.	40°F. To -10°F.	0°F. To -65°F.	
GAA - GREASE, Automotive and Artillery		ALL TEMPERATURES			Intervals given are in hours of normal operation

FOLD

FOLD

MEC 3810-287-15/3-1(10)

Figure 3-1 (10).—Continued.

LUBRICATION CHART

CRANE-SHOVEL, CRAWLER MOUNTED, 12½ TON ¾ CU. YD; DIESEL ENGINE (LORAIN MODEL L 36M) W/ ENGINE DETROIT DIESEL MODEL 3055C

REFERENCE: C9100-IL

Intervals are based on normal hours of operations. Adjust to compensate for abnormal operations and severe conditions. During inactive periods, sufficient lubrication must be performed for adequate preservation.

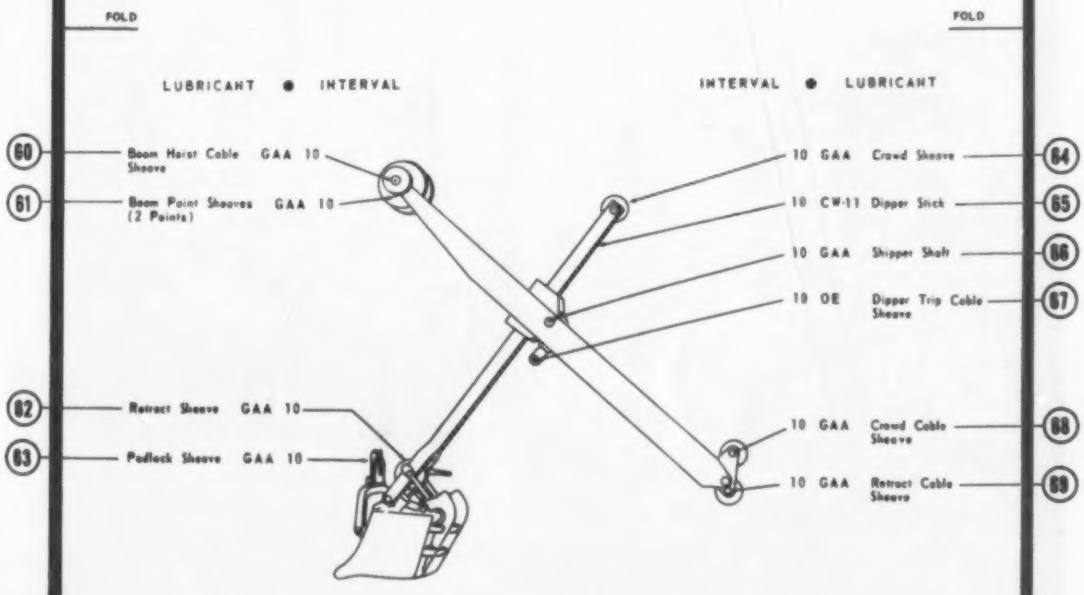
Clean fittings before lubricating.

Relubricate after washing or fording.

A dotted circle indicates a drain below.

Clean parts with SOLVENT, dry-cleaning, or with OIL, fuel, Diesel. Dry before lubricating.

Lubricate points indicated by dotted arrow shafts on both sides of equipment.


FOLD
FOLD
LUBRICANT ● INTERVAL
INTERVAL ● LUBRICANT
60 Boom Hoist Cable Sheave GAA 10
61 Boom Point Sheaves (2 Points) GAA 10
62 Retract Sheave GAA 10
63 Padlock Sheave GAA 10
10 GAA Crowd Sheave 64
10 CW-11 Dipper Stick 65
10 GAA Shipper Shaft 66
10 OE Dipper Trip Cable Sheave 67
10 GAA Crowd Cable Sheave 68
10 GAA Retract Cable Sheave 69

SHOVEL FRONT ASSEMBLY

MEC 3810-287-15/3-1(11)

Figure 3-1 (11).—Continued.

-KEY-

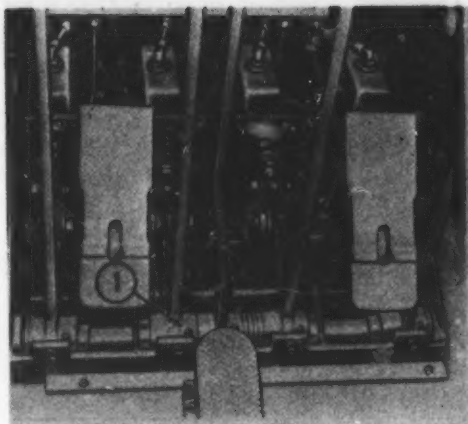
LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above + 32°F	40°F To -10°F.	0°F To -65°F.	
OE - OIL, Heavy Duty Engine Crankcase Oil Can Points OES - OIL Engine, sub-zero		OE 30	OE 10	OES	Intervals given are in hours of normal operation
CW-11 LUBRICATING OIL, Exposed gear		ALL TEMPERATURES			
GAA - GREASE - Automotive and Artillery		ALL TEMPERATURES			

FOLD

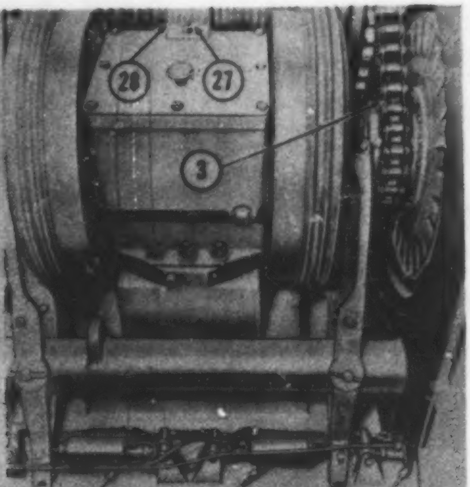
FOLD

MEC 3810-287-15/3-1(12)

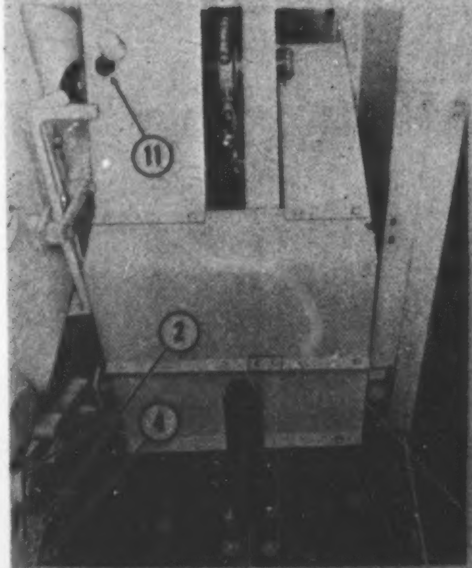
Figure 3-1 (12).—Continued.



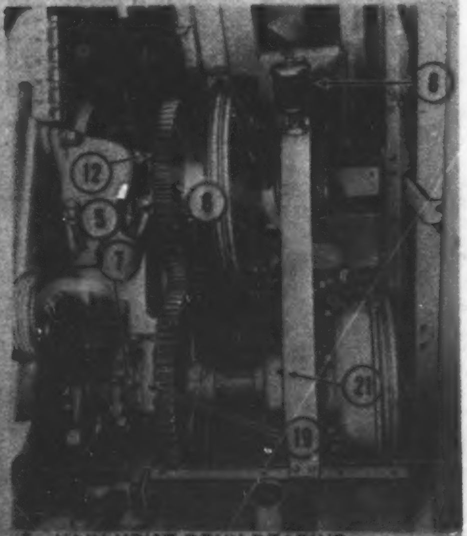
1. CONTROL LEVER BUSHINGS



3. POWER BOOM LOWERING CHAIN
27. VERTICAL SWING TOP BEARING
28. REVERSE SHAFT END BEARING



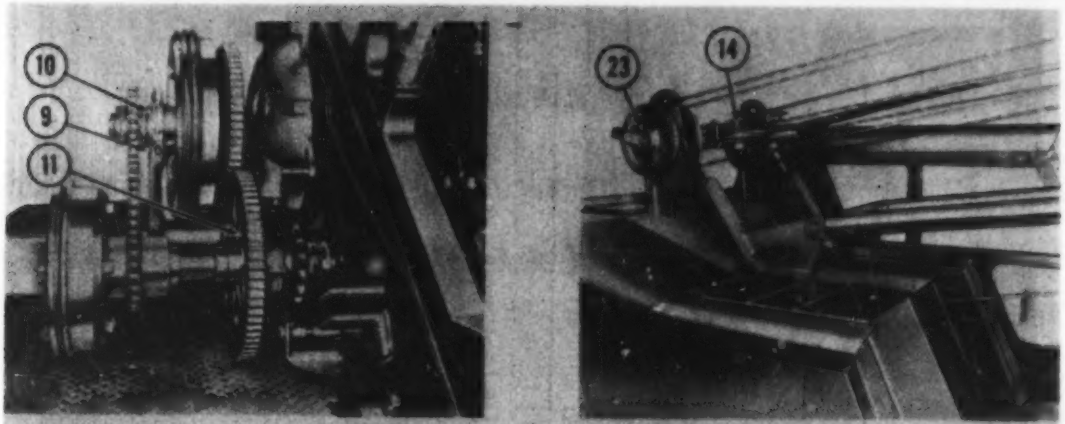
2. SHEARBALL
4. VERTICAL SWING
11. OPEN GEARS



5. MAIN HOIST DRUM BEARING
6. BOOM HOIST SPROCKET BUSHING
7. BOOM LOWERING SPROCKET BEARING
8. BOOM LOWERING CHAIN LUBRICATOR
12. REVERSE GEAR BEARING
19. PILLOW BLOCK BEARING
21. HOIST SPROCKET BEARING

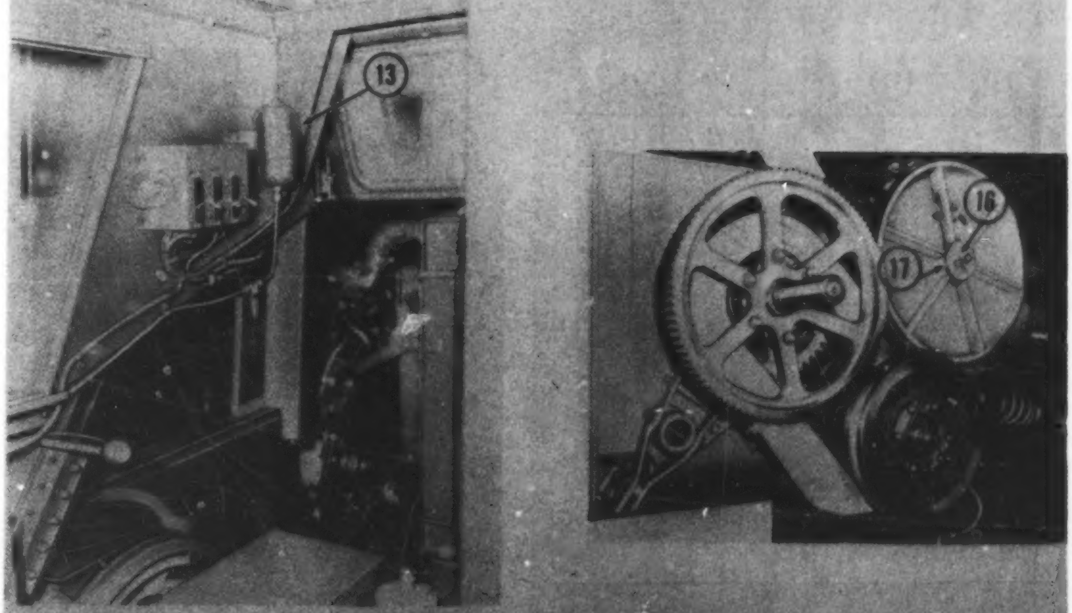
MEC 3810-287-15/3-1(13)

Figure 3-1 (13).—Continued.



9. CONE COLLAR SHIFTER SHOES
10. CONE COLLARS
11. OPEN GEARS

14. GANTRY SHEAVES
23. A-FRAME SHEAVE BUSHINGS

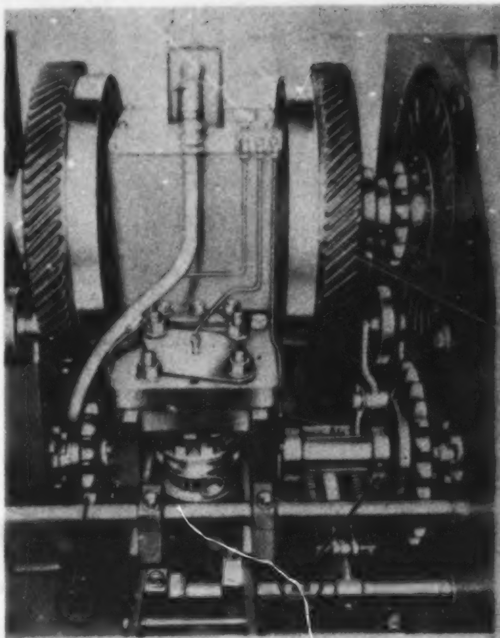


13. HYDRAULIC RESERVOIR (CONTROLS)

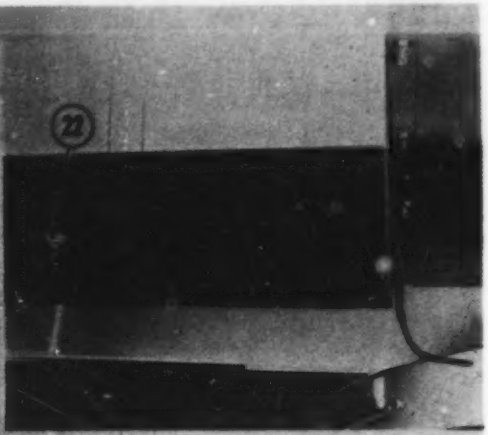
16. BOOM HOIST SHAFT BEARING
17. SECONDARY HOIST DRUM BEARING

MEC 3810-287-15/ 3-1 (14)

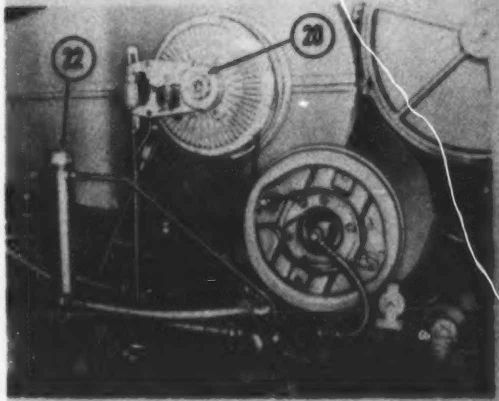
Figure 3-1 (14).—Continued.



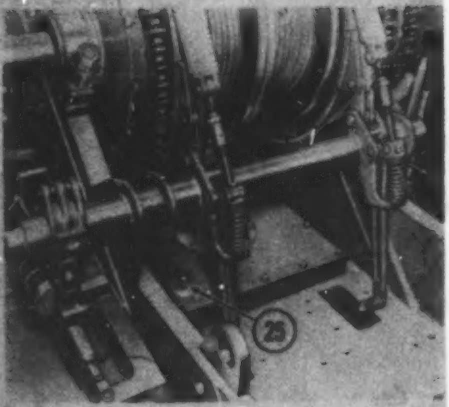
18. LOAD LOWERING SPROCKET BEARING
21. HOIST SPROCKET BEARING



22. HYDRAULIC RESERVOIR DRAIN



20. MORIN TAGMASTER
22. HYDRAULIC RESERVOIR (MAIN)



25. GEAR CASE FILLER PLUG

MEC 3810-287-15/ 3-1 (15

Figure 3-1(15).—Continued.

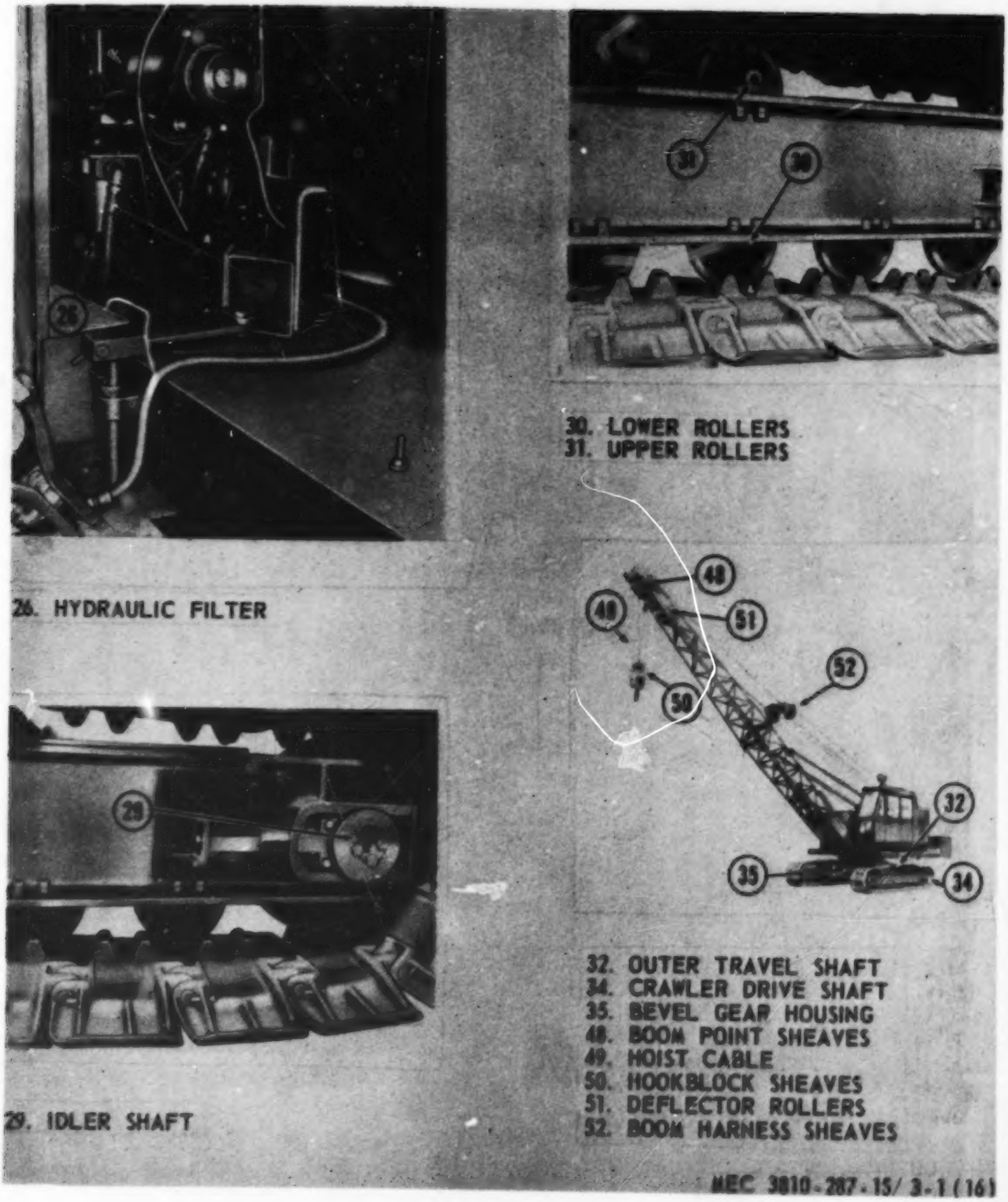
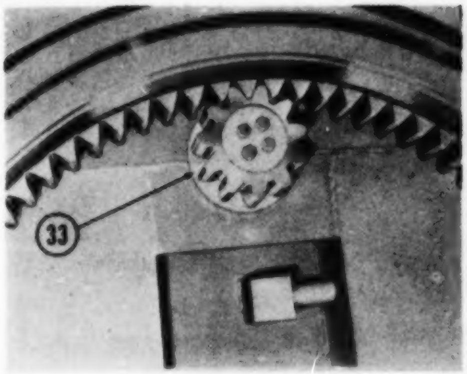
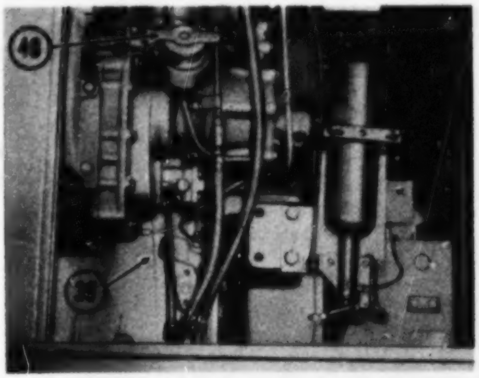

26
26. HYDRAULIC FILTER
31
30
30. LOWER ROLLERS
31. UPPER ROLLERS
28
29. IDLER SHAFT
48
49
51
52
50
32
35
34
32. OUTER TRAVEL SHAFT
34. CRAWLER DRIVE SHAFT
35. BEVEL GEAR HOUSING
48. BOOM POINT SHEAVES
49. HOIST CABLE
50. HOOKBLOCK SHEAVES
51. DEFLECTOR ROLLERS
52. BOOM HARNESS SHEAVES
MEC 3810-287-15/3-1(16)

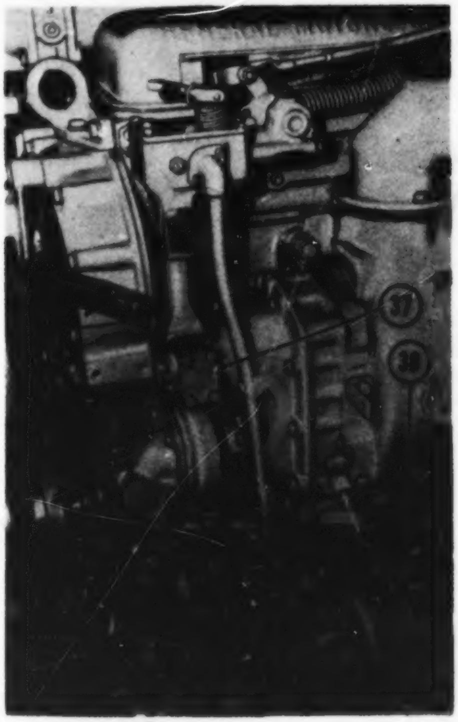
Figure 3-1 (16)—Continued.



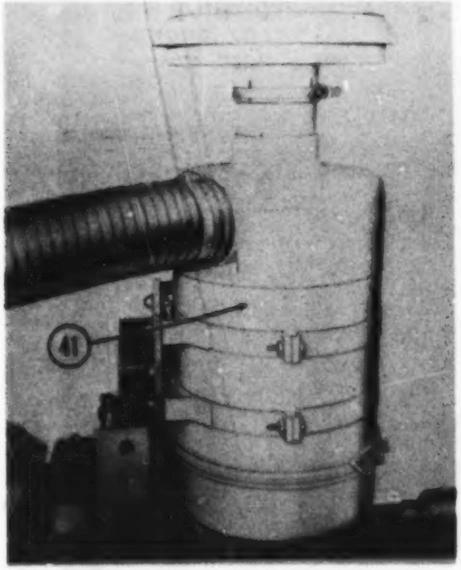
33. SWING GEAR



39. CRANKCASE OIL LEVEL GAGE
40. CRANKCASE OIL FILL CAP



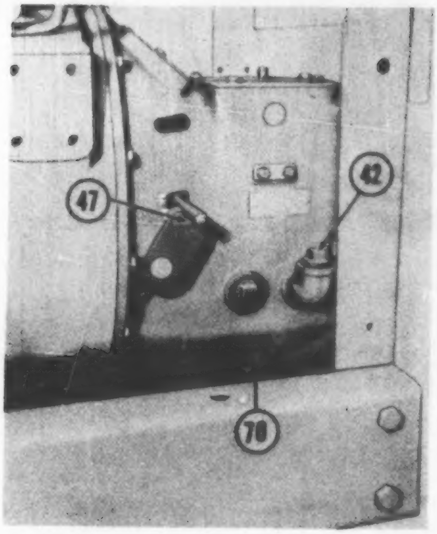
37. GOVERNOR DRIVE
38. OIL FILTER



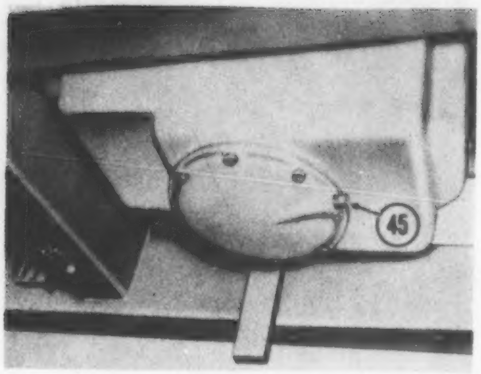
41. AIR CLEANER

MEC 3810-287-15/3-1 (17)

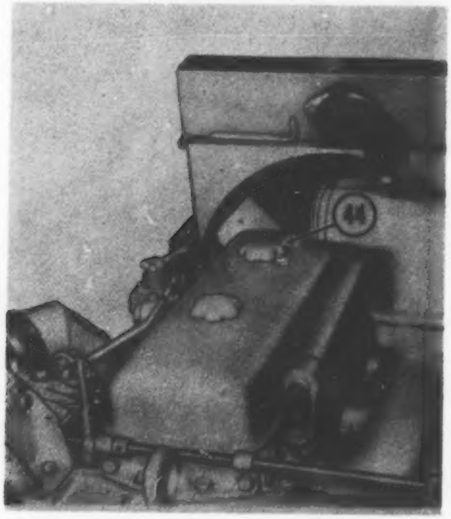
Figure 3-1 (17).—Continued.



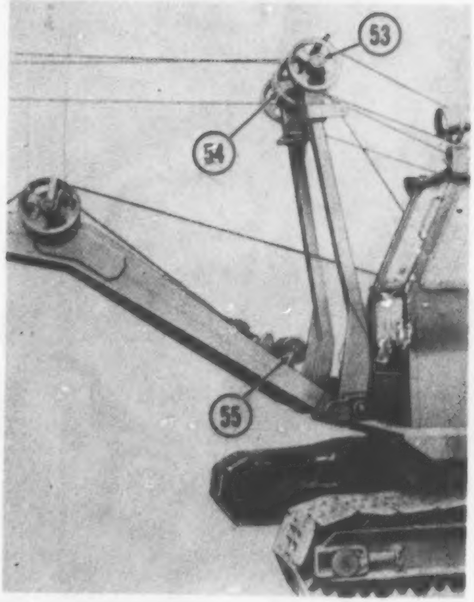
42. TRANSMISSION FILL AND LEVEL PLUG
47. CLUTCH THROWOUT BEARING
70. TRANSMISSION DRAIN



45. CRANKCASE DRAIN PLUG



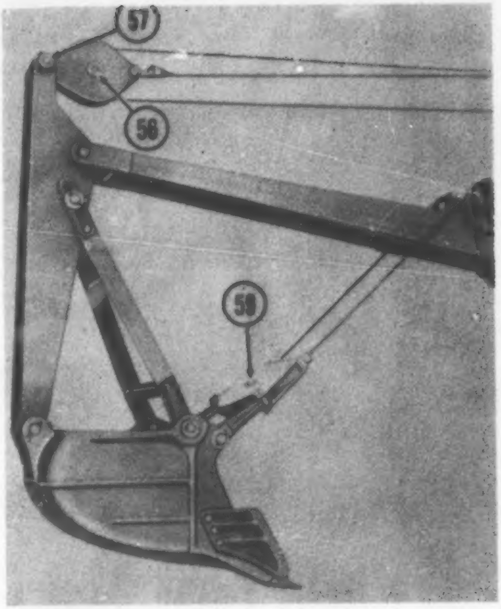
44. CRANKCASE BREATHER



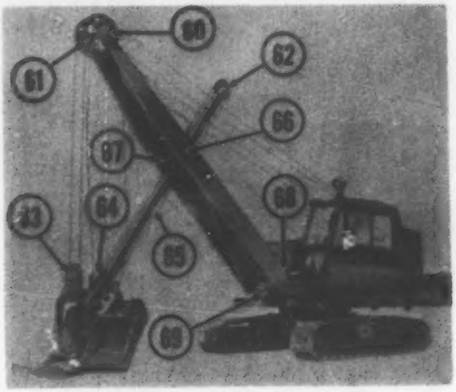
53. GANTRY SHEAVES
54. HOIST CABLE SHEAVES
55. ROLLERS

MEC 3810-287-15/3-1 (18)

Figure 3-1 (18).—Continued.



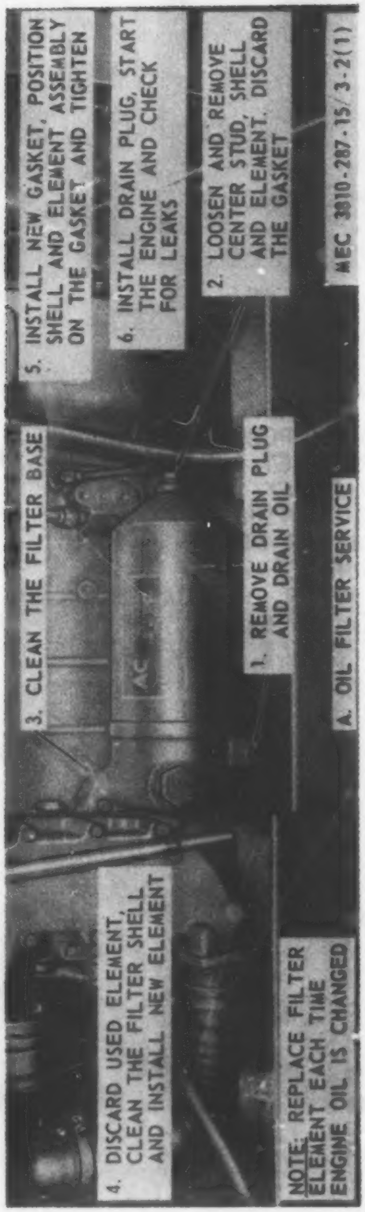
56. DIPPER HANDLE SHEAVES
57. DIPPER HANDLE SHEAVE HINGE PIN
58. DIPPER HANDLE HINGE PIN
59. PADLOCK SHEAVE



60. BOOM HOIST CABLE SHEAVE
61. BOOM POINT SHEAVES
62. RETRACT SHEAVE
63. PADLOCK SHEAVE
64. CROWD SHEAVE
65. DIPPER STICK
66. SHIPPER SHAFT
67. DIPPER TRIP CABLE SHEAVE
68. CROWD CABLE SHEAVE
69. RETRACT CABLE SHEAVE

MEC 3810-287-15/ 3-1 (19)

Figure 3-1 (19)—**Continued.**



4. DISCARD USED ELEMENT, CLEAN THE FILTER SHELL AND INSTALL NEW ELEMENT

3. CLEAN THE FILTER BASE

5. INSTALL NEW GASKET, POSITION SHELL AND ELEMENT ASSEMBLY ON THE GASKET AND TIGHTEN

1. REMOVE DRAIN PLUG AND DRAIN OIL

6. INSTALL DRAIN PLUG, START THE ENGINE AND CHECK FOR LEAKS

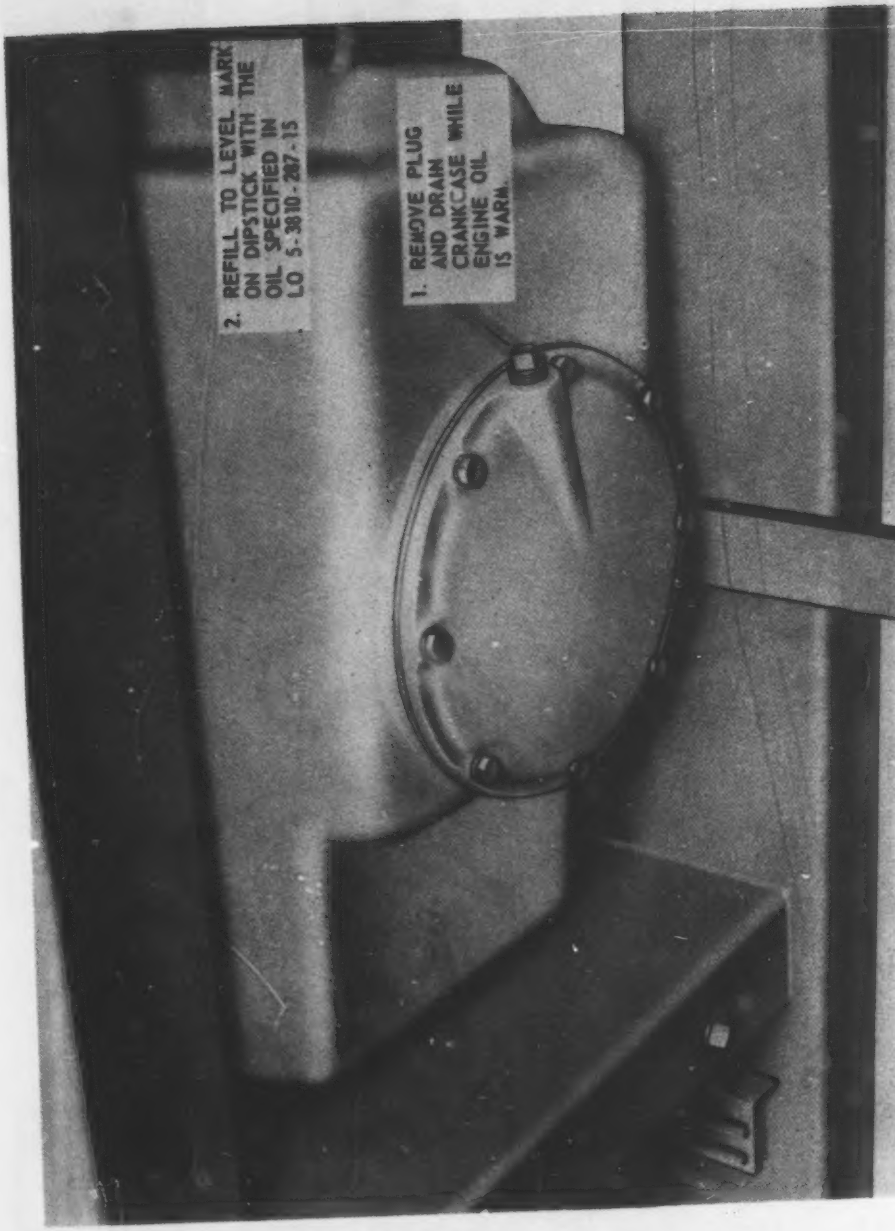
2. LOOSEN AND REMOVE CENTER STUD, SHELL AND ELEMENT. DISCARD THE GASKET

NOTE: REPLACE FILTER ELEMENT EACH TIME ENGINE OIL IS CHANGED

A. OIL FILTER SERVICE

MEC 3810-287-15/3-2(1)

Figure 3-8 (1). Engine crankcase and oil filter service.


2. REFILL TO LEVEL MARK ON DIPSTICK WITH THE OIL SPECIFIED IN LO 5-3810-287-15
1. REMOVE PLUG AND DRAIN CRANKCASE WHILE ENGINE OIL IS WARM.

MEC 3810-287-15 3-2(2)

B. CRANKCASE SERVICE

Figure 3-2 (2).—Continued.

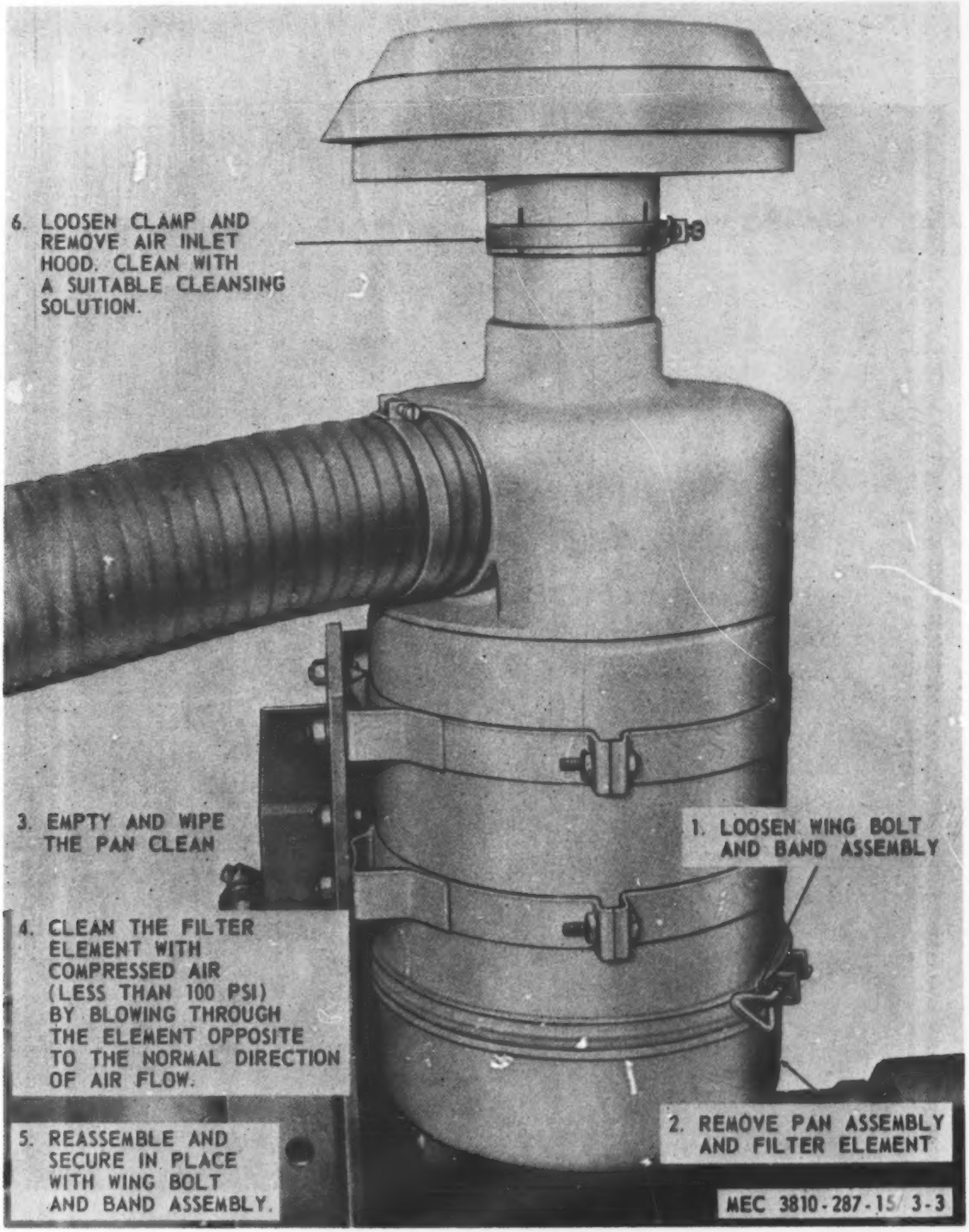

6. LOOSEN CLAMP AND REMOVE AIR INLET HOOD. CLEAN WITH A SUITABLE CLEANSING SOLUTION.
3. EMPTY AND WIPE THE PAN CLEAN
1. LOOSEN WING BOLT AND BAND ASSEMBLY
4. CLEAN THE FILTER ELEMENT WITH COMPRESSED AIR (LESS THAN 100 PSI) BY BLOWING THROUGH THE ELEMENT OPPOSITE TO THE NORMAL DIRECTION OF AIR FLOW.
2. REMOVE PAN ASSEMBLY AND FILTER ELEMENT
5. REASSEMBLE AND SECURE IN PLACE WITH WING BOLT AND BAND ASSEMBLY.
MEC 3810-287-15/3-3

Figure 3-3. Air cleaner service.

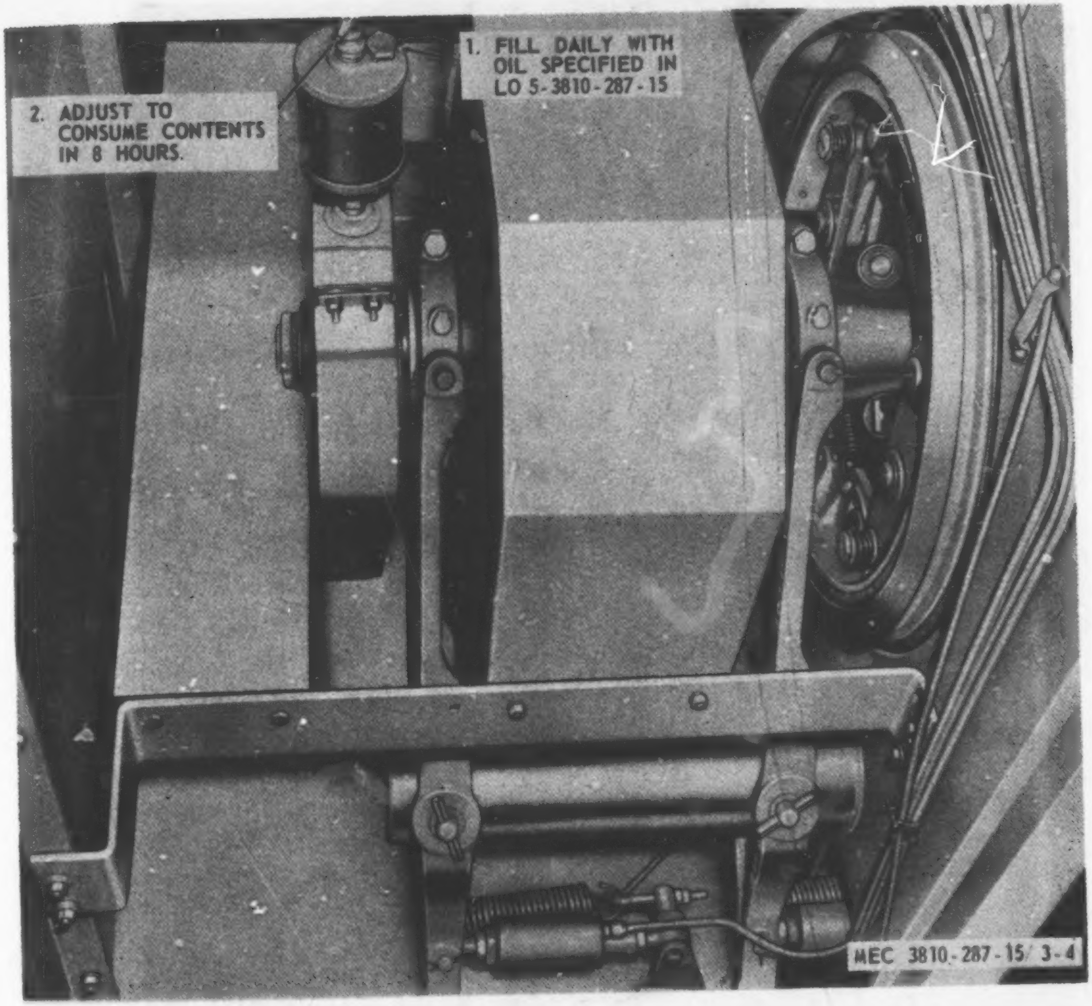

1. FILL DAILY WITH OIL SPECIFIED IN LO 5-3810-287-15
2. ADJUST TO CONSUME CONTENTS IN 8 HOURS.
MEC 3810-287-15/3-4

Figure 3-4. Drip oiler service.

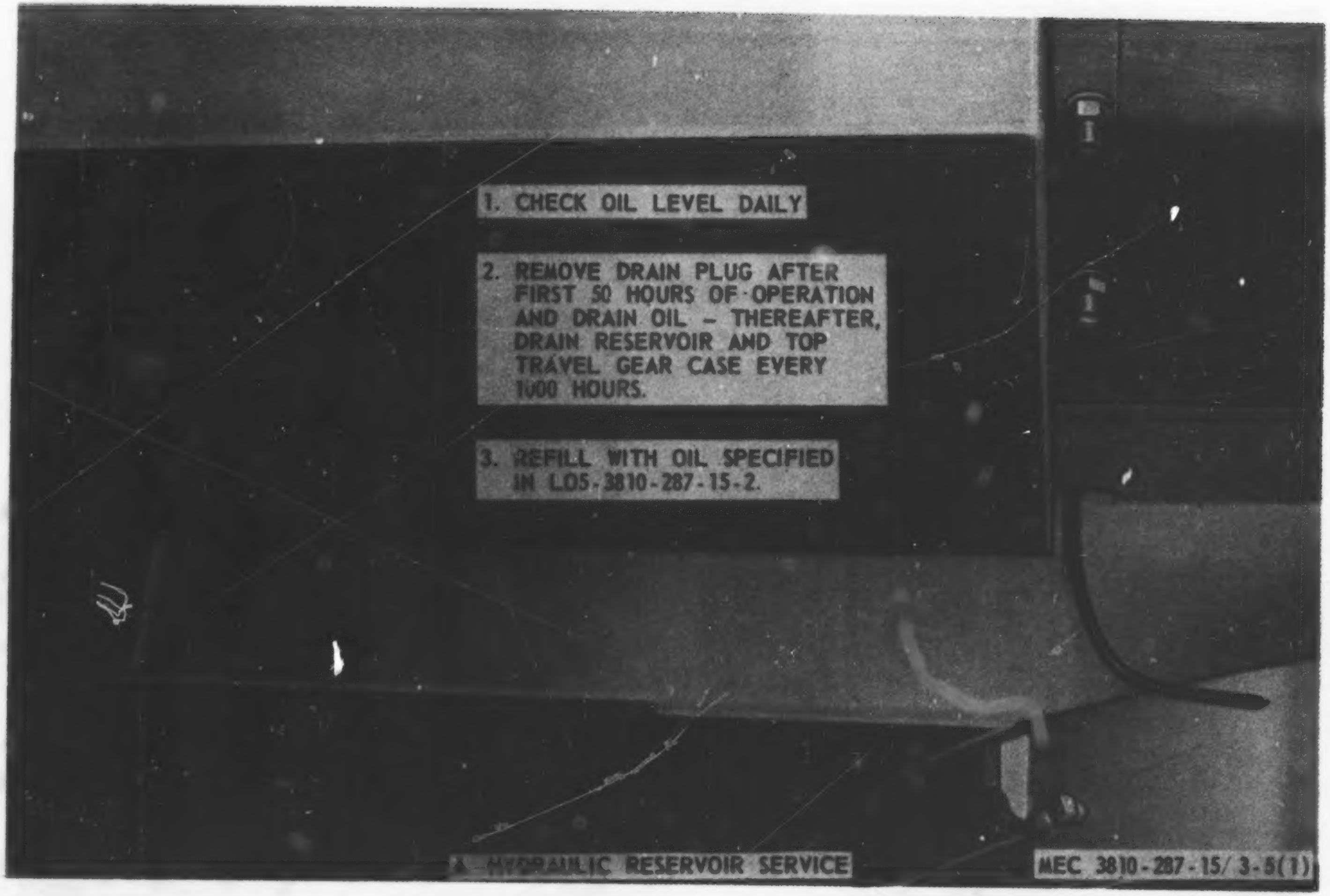
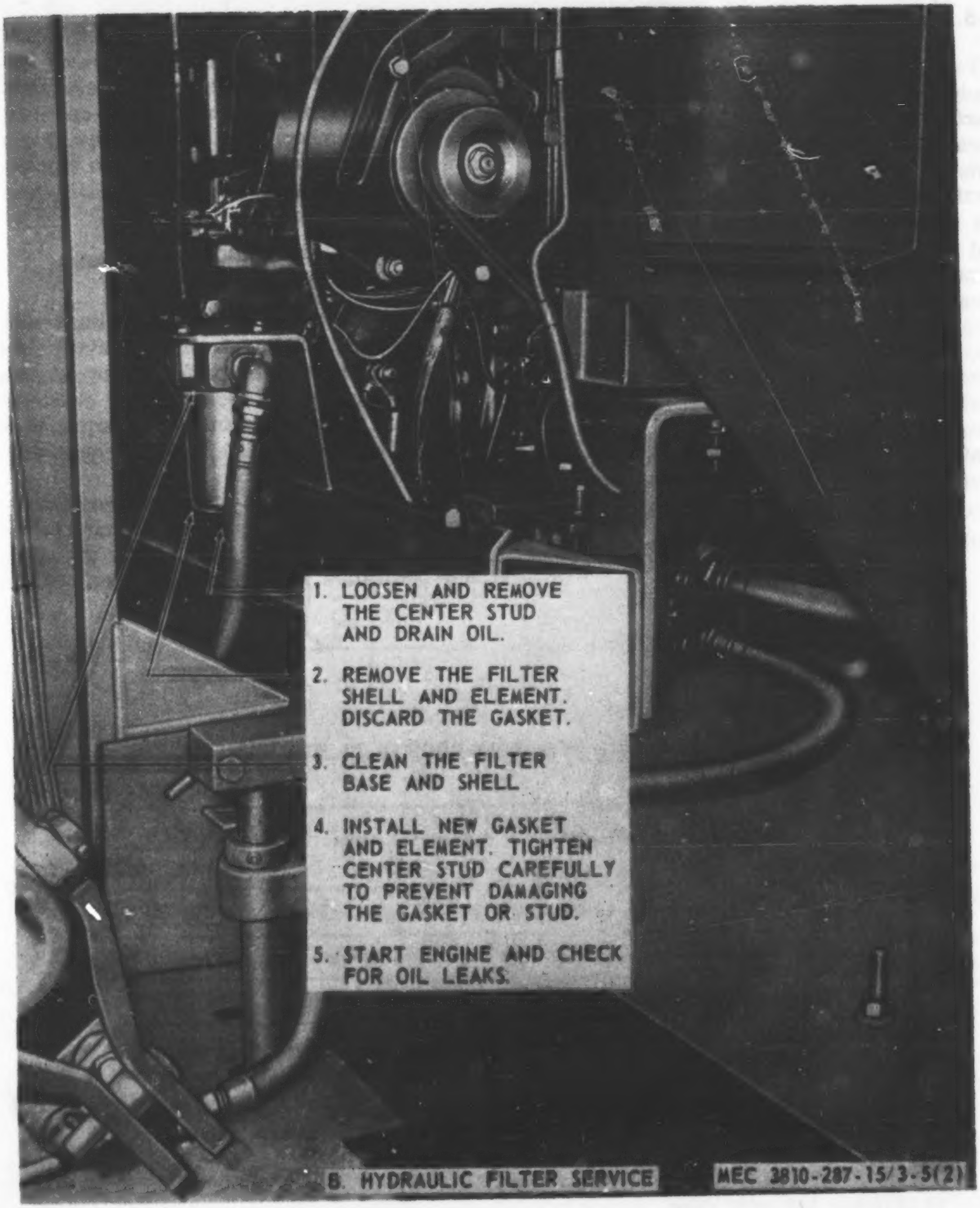

1. CHECK OIL LEVEL DAILY
2. REMOVE DRAIN PLUG AFTER FIRST 50 HOURS OF OPERATION AND DRAIN OIL – THEREAFTER, DRAIN RESERVOIR AND TOP TRAVEL GEAR CASE EVERY 1000 HOURS.
3. REFILL WITH OIL SPECIFIED IN LO5-3810-287-15-2.
A HYDRAULIC RESERVOIR SERVICE
MEC 3810-287-15/3-5(1)

Figure 3-5 (1). Hydraulic reservoir and filter service.



1. LOOSEN AND REMOVE THE CENTER STUD AND DRAIN OIL.
2. REMOVE THE FILTER SHELL AND ELEMENT. DISCARD THE GASKET.
3. CLEAN THE FILTER BASE AND SHELL.
4. INSTALL NEW GASKET AND ELEMENT. TIGHTEN CENTER STUD CAREFULLY TO PREVENT DAMAGING THE GASKET OR STUD.
5. START ENGINE AND CHECK FOR OIL LEAKS.

B. HYDRAULIC FILTER SERVICE

MEC 3810-287-15/3-5(2)

Figure 3-5 (2).—Continued.

Section III. PREVENTIVE MAINTENANCE SERVICES

3-5. General

To insure that the Lorain crane-shovel is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance services to be performed are listed and described in paragraphs 3-6 and 3-7. Item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit shall be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noticed which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded together with the corrective action taken on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) at the earliest possible opportunity.

3-6. Daily Preventive Maintenance Services

This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by the operator. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3-6 for the daily preventive maintenance services.

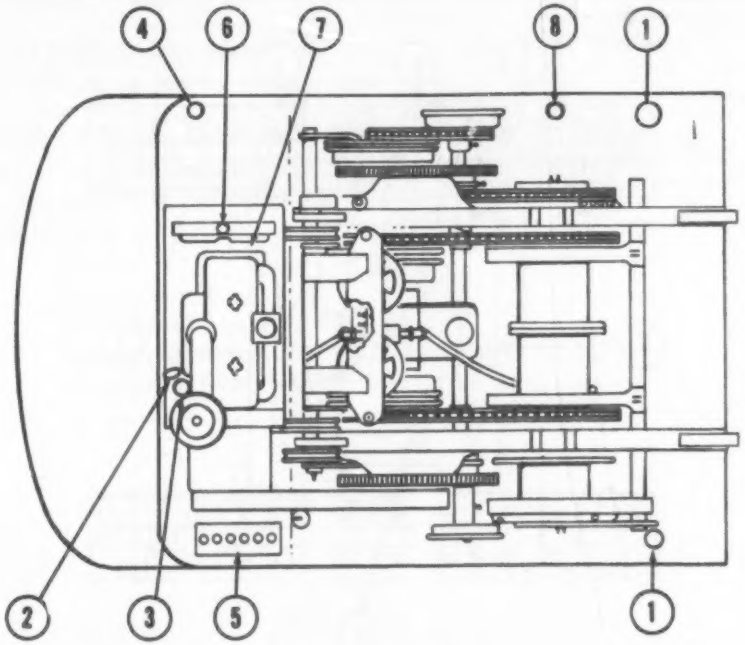
3-7. Quarterly Preventive Maintenance Services

a. This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by organizational maintenance personnel at quarterly intervals. A quarterly interval is equal to 3 calendar months, or 250 hours of operation, whichever occurs first.

b. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3-7 for the quarterly preventive maintenance services.

PREVENTIVE MAINTENANCE SERVICES

DAILY



LUBRICATE IN ACCORDANCE WITH LO5-3810-287-15

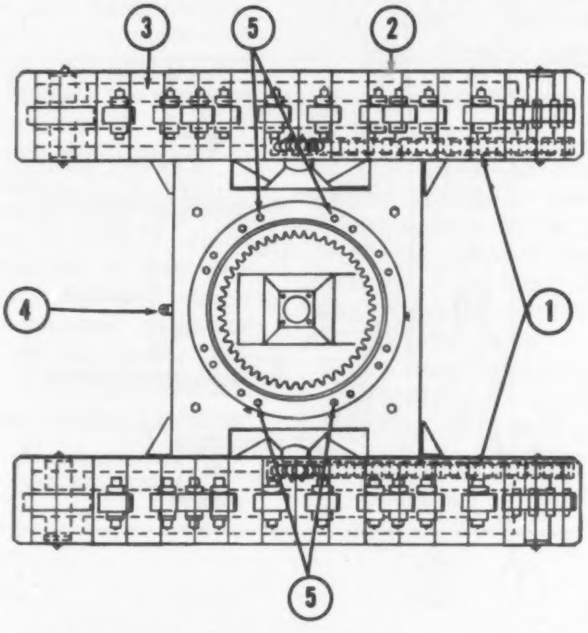
ITEM		PAR REF
1	**LIGHTS**. Test all lights for proper operation. Replace a broken or faulty light.	3-74
2	**ENGINE OIL LEVEL**. Add oil as indicated by level gage.	3-3
3	**FUEL FILTER**. Tighten thumb nut if leaking. (Clean Weekly)	3-9
4	**FUEL TANK**. Add fuel as required. Replace a defective cap.	3-55
5	**BATTERIES**. Tighten loose cables and mountings. Remove corrosion. Inspect for cracks and leaks. Fill to 3/8 inch above plates. Clean vent hole in filler cap before installing. In freezing weather run engine a minimum of one hour after adding water. (Weekly)	3-20

MEC 3810-287-15/3-6(1)

Figure 3-6 (1). Daily preventive maintenance services.

PREVENTIVE MAINTENANCE SERVICES

DAILY



LUBRICATE IN ACCORDANCE WITH LO5-3810-287-15

ITEM		PAR REF
1	DRIVE CHAIN. Inspect for proper adjustment. 1" to 2" inch sag on bottom of chain with upper part tight. Check for damaged links.	3-21
2	CRAWLER TREAD BELT. Inspect for proper adjustment and damage. 1 inch sag at top between front idler roller and upper carrier roller.	3-22
3	CRAWLER TREAD KEEPER PINS. Inspect for broken or missing keeper pins.	3-107
4	CRAWLER GEAR BOX. Check oil level. Add if necessary.	3-3
5	SHEAR BALL MOUNTING BOLTS. For the first eight (8) weeks of a new machine's operation, check bolts for proper torque of 650 foot pounds every (40) hours of operation. After eight (8) weeks expire, see quarterly maintenance.	3-4

MEC 3810-287-15/3-6(3)

Figure 3-6 (2).—Continued.

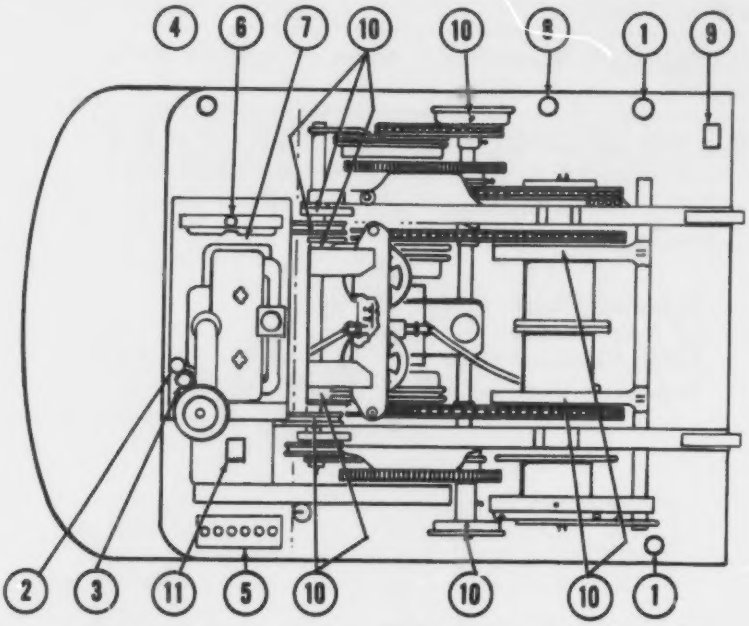
ITEM		PAR REF
6	**RADIATOR LEVEL.** Fill to two inches below filler neck.	3-56
7	**BELTS**. Adjust from 1/2 to 3/4 inch deflection at midway between pulleys. (Weekly)	3-61 3-62
8	**FIRE EXTINGUISHER**. Inspect for a broken seal, if not broken extinguisher is in proper working order.	2-28
9	**CONTROLS AND INSTRUMENTS**. Replace damaged instruments. Tighten loose mounting. With the unit operating, inspect for proper operation. Normal operating readings for instruments are as follows: Temperature Gage – 160° – 185° Oil Pressure Gage – 45 p.s.i. Battery Generator Gage – In green area Tachometer Gage – 1640 rpm	2-17

MEC 3810-287-15/ 3-6(2)

Figure 3-6 (3).—Continued.

PREVENTIVE MAINTENANCE SERVICES

QUARTERLY



LUBRICATE IN ACCORDANCE WITH LO5-3810-287-15

ITEM		PAR REF
1	**LIGHTS.** Check for any defective light or leads. Replace as necessary.	3-74
2	**ENGINE OIL LEVEL.** Add oil as indicated by level gage.	3-3
3	**FUEL FILTER.** Tighten thumb nut if leaking. Clean a dirty strainer element. Replace as necessary.	3-9
4	**FUEL TANK.** Add fuel as required. Tighten loose mounting. Replace leaking fuel tank. Replace defective cap gasket. Clean cap vent.	3-55
5	**BATTERIES.** Tighten loose cables and mountings. Remove corrosion. Fill to 3/8 inch above the plates. Clean vent hole in filler cap before installing. In freezing weather, run engine a minimum of one hour after adding water. Repair or replace a cracked or leaking battery.	3-20

MEC 3810-287-15/ 3-7(1)

Figure 3–7 (1). Quarterly preventive maintenance services.

ITEM		PAR REF
6	RADIATOR LEVEL. Proper coolant level is two inches below filler neck. Replace cracked or frayed hose. Replace defective radiator. Remove obstructions in the air passages. Tighten all mounting and leaking connections. Correct cap pressure rating is four pounds.	3-19
7	BELTS. Proper adjustment is a deflection of 1/2 to 3/4 inch midway between pulleys. Replace a worn, frayed or cracked belt.	3-61 3-62
8	FIRE EXTINGUISHER. Inspect for broken seal. Inspect for full charge by shaking for sound or by weight.	2-28
9	CONTROLS AND INSTRUMENTS. Replace damaged instruments. Tighten loose mounting. With the unit operating, check for proper operation. Normal operating readings for instruments are as follows: Temperature Gage – 160° – 185° Oil Pressure Gage – 45 p.s.i. Battery Generator Gage – In green area Tachometer Gage – 1640 rpm	2-17
10	CLUTCH AND BRAKE CONTROLS. Adjust the clutches and brakes if they overheat, jump out of engagement or do not pull. Replace any damaged or worn parts.	3-15
11	ENGINE CLUTCH. Adjust the clutch if necessary. Inspect and report excessively worn or damaged parts.	3-16

MEC 3810-287-15/ 3-7(2)

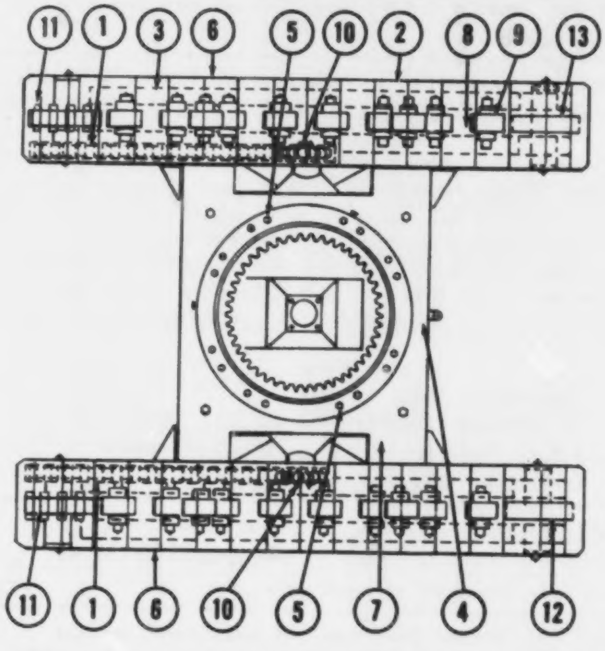
Figure 3-7 (2).—Continued.

best copy available

Reproduced from poor document.

PREVENTIVE MAINTENANCE SERVICES

QUARTERLY



LUBRICATE IN ACCORDANCE WITH LO5-3810-287-15

ITEM		PAR REF
1	**DRIVE CHAIN.** Inspect for proper adjustment. 1" to 2" inch sag on bottom of chain with upper part tight. Check and replace damaged or excessively worn links.	3-21
2	**CRAWLER TREAD BELT.** Inspect for proper adjustment and damage. Proper adjustment is 1 inch sag at top between front idler roller and upper carrier roller. Check and replace damaged or excessively worn crawler pads.	3-22
3	**CRAWLER TREAD KEEPER PINS.** Inspect and replace damaged, excessively worn or missing keeper pins.	3-107
4	**CRAWLER GEAR BOX.** Inspect oil level. Add if necessary.	3-3

MEC 3810-287-15/ 3-7(3)

Figure 3-7 (3).—Continued.

ITEM		PAR REF
5	SHEAR BALL MOUNTING BOLTS. Inspect mounting bolts for proper torque of 650 foot pounds during each quarterly maintenance period after the first eight (8) weeks of operation.	3-4
6	CRAWLER SIDE FRAMES. Inspect for cracks or damage.	8-17
7	CRAWLER BED. Inspect for cracks or damage on crawler bed.	8-17
8	CRAWLER TREAD PINS. Inspect and replace damaged or excessively worn tread pins.	3-107
9	IDLER ROLLERS. Inspect and replace damaged or excessively worn idler rollers, bushings or seals in upper and lower idler rollers.	8-6
10	CROSS TRAVEL SHAFT. Inspect for excessive wear in cross travel shaft bushings.	5-35
11	MAIN DRIVE SPROCKET. Inspect for damaged or excessively worn drive sprockets, bearings and seals.	5-35
12	FRONT IDLER ROLLERS. Inspect for damaged or excessively worn front idler rollers, bearings and seals.	8-5

MEC 3810-287-15/ 3-7(4)

Figure 3-7 (4).—Continued.

Section IV. OPERATOR'S MAINTENANCE

3–8. General

Instructions in this section are published for the information and guidance of the operator to maintain the Lorain crane-shovel.

3–9. Fuel Filter Service

Refer to figure 3–8 and service the fuel filter.

3–10. Fan V-belt Adjustment

Refer to figure 3–9 and adjust the fan V-belt.

3–11. Alternater V-belt Adjustment

Refer to figure 3–10 and adjust the alternator V-belt.

3–12. Clutch Shaft Assembly

The Lorain crane-shovel utilizes a clutch shaft assembly which contains the five primary clutches used in the operation of the machine. The location and function of these clutches are illustrated and described on figure 3–11.

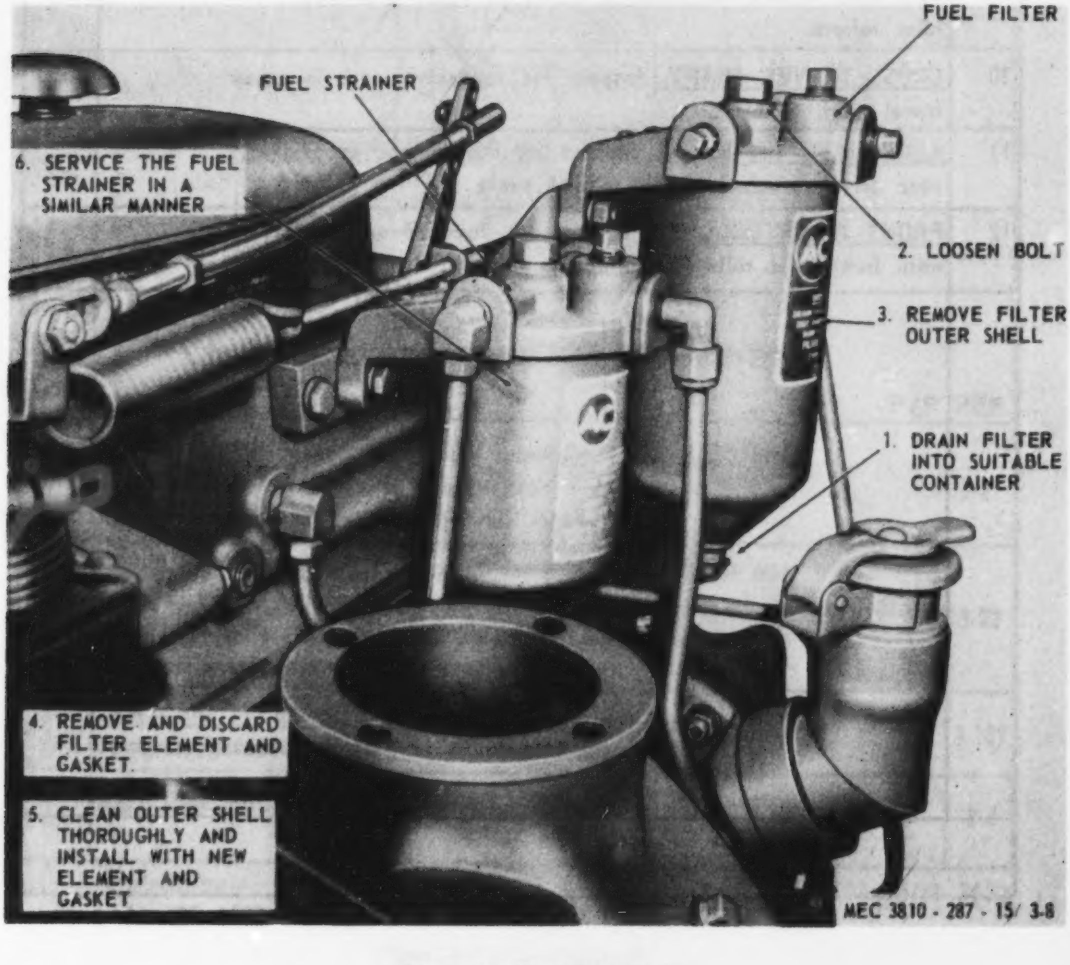

FUEL FILTER
FUEL STRAINER
6. SERVICE THE FUEL STRAINER IN A SIMILAR MANNER
2. LOOSEN BOLT
3. REMOVE FILTER OUTER SHELL
1. DRAIN FILTER INTO SUITABLE CONTAINER
4. REMOVE AND DISCARD FILTER ELEMENT AND GASKET
5. CLEAN OUTER SHELL THOROUGHLY AND INSTALL WITH NEW ELEMENT AND GASKET
MEC 3810 - 287 - 15/ 3-8

Figure 3–8. Fuel filter service.

3-13. Clutch Shaft Clutch Adjustment

Refer to figure 3-12 and adjust the clutch shaft clutches.

3-14. Power Boom Lowering and Power Load Lowering Clutch Adjustment

Refer to figure 3-13 and adjust the power load lowering and power boom lowering clutches.

3-15. Hoist, Boom Hoist and Third Drum Brake Adjusiment

Refer to figure 3-14 and adjust the hoist, boom hoist, and third drum brakes.

3-16. Engine Clutch Adjustment

Refer to figure 3-15 and adjust the engine clutch.

3-17. Engine Clutch Release Mechanism Adjustment

Refer to figure 3-16 and adjust the engine clutch release mechanism.

3-18. Cold Weather Starting and Service

Refer to figure 3-17 and service the cold weather starting aid.

3-19. Cooling System Service

Refer to figure 3-18 and service the cooling system. Refer to table 2-1 for freezing points, composition, and specific gravities of military antifreeze materials.

3-20. Battery Service

Refer to figure 3-19 and service the batteries.

3-21. Crawler Drive Chain Adjustment

Refer to figure 3-20 and adjust the crawler drive chains.

3-22. Crawler Belt Adjustment

Refer to figure 3-21 and adjust the crawler belts.

3-23. Transmission Breather Service

Refer to figure 3-22 and service the transmission breather.

3-24. Master Cylinder Service

Refer to figure 3-23 and service the master cylinders.

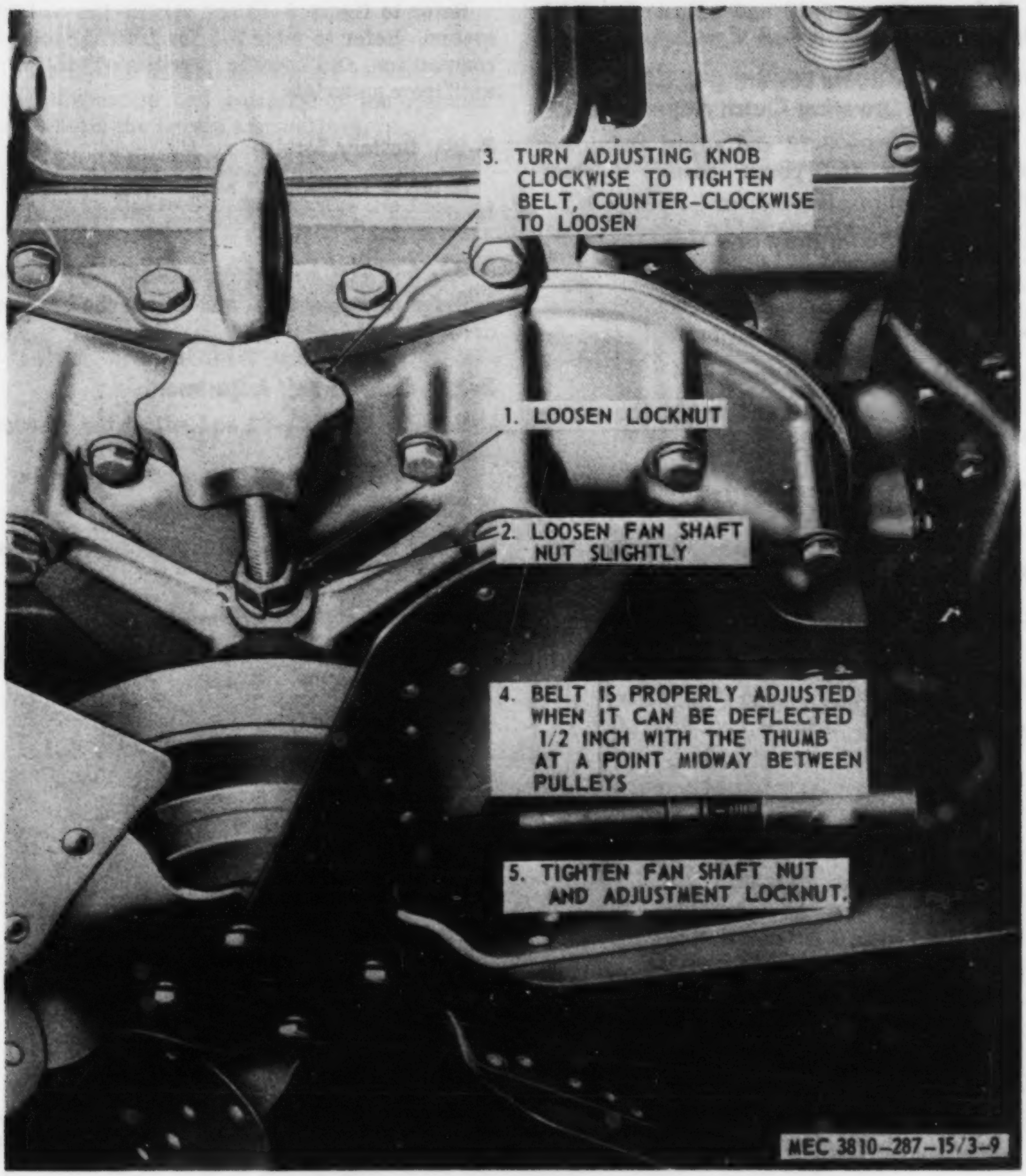

3. TURN ADJUSTING KNOB CLOCKWISE TO TIGHTEN BELT, COUNTER-CLOCKWISE TO LOOSEN
1. LOOSEN LOCKNUT
2. LOOSEN FAN SHAFT NUT SLIGHTLY
4. BELT IS PROPERLY ADJUSTED WHEN IT CAN BE DEFLECTED 1/2 INCH WITH THE THUMB AT A POINT MIDWAY BETWEEN PULLEYS
5. TIGHTEN FAN SHAFT NUT AND ADJUSTMENT LOCKNUT.
MEC 3810-287-15/3-9

Figure 3-9. Fan V-belt adjustment.

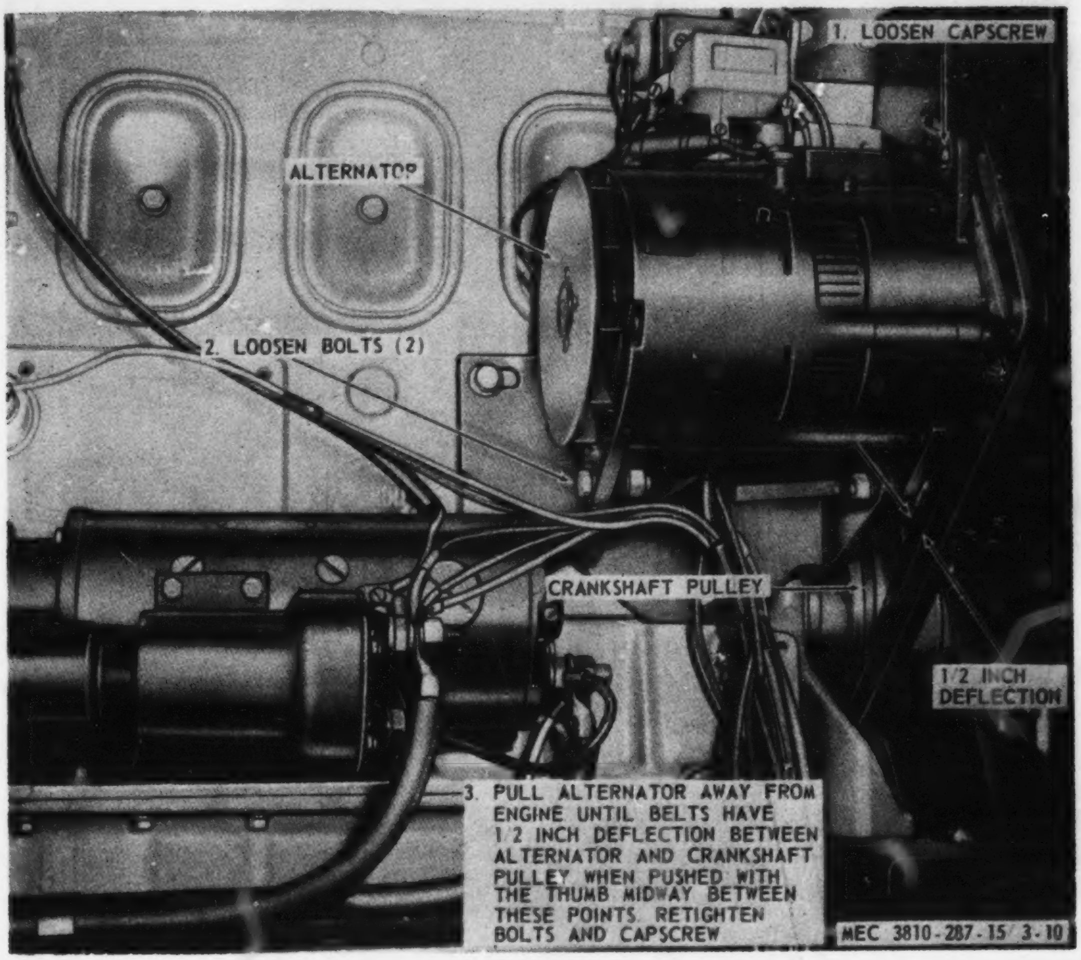

1. LOOSEN CAPSCREW
ALTERNATOR
2. LOOSEN BOLTS (2)
CRANKSHAFT PULLEY
1/2 INCH DEFLECTION
3. PULL ALTERNATOR AWAY FROM ENGINE UNTIL BELTS HAVE 1/2 INCH DEFLECTION BETWEEN ALTERNATOR AND CRANKSHAFT PULLEY WHEN PUSHED WITH THE THUMB MIDWAY BETWEEN THESE POINTS. RETIGHTEN BOLTS AND CAPSCREW
MEC 3810-287-15/3-10

Figure 3-10. Alternater V-belt adjustment.

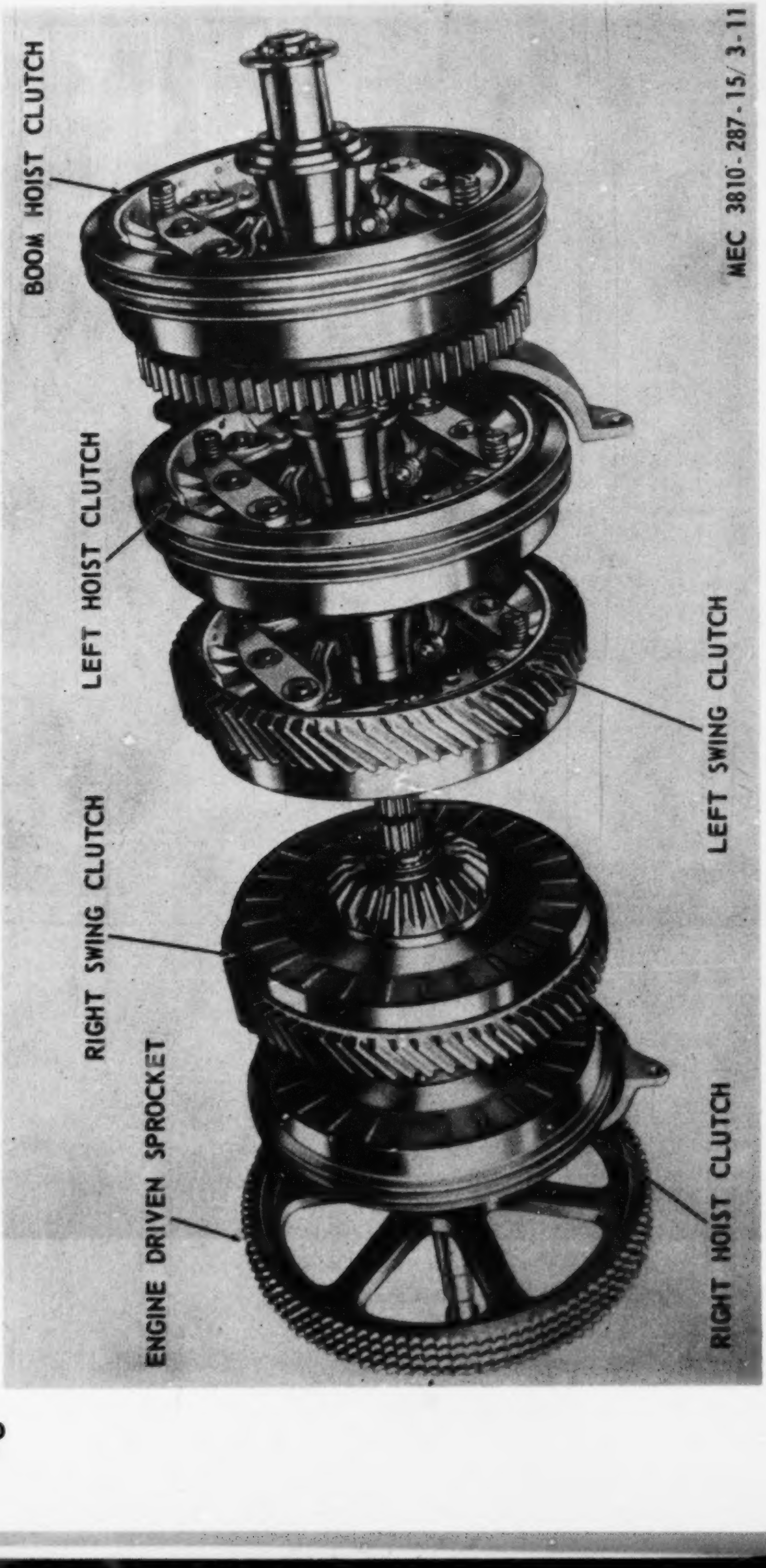
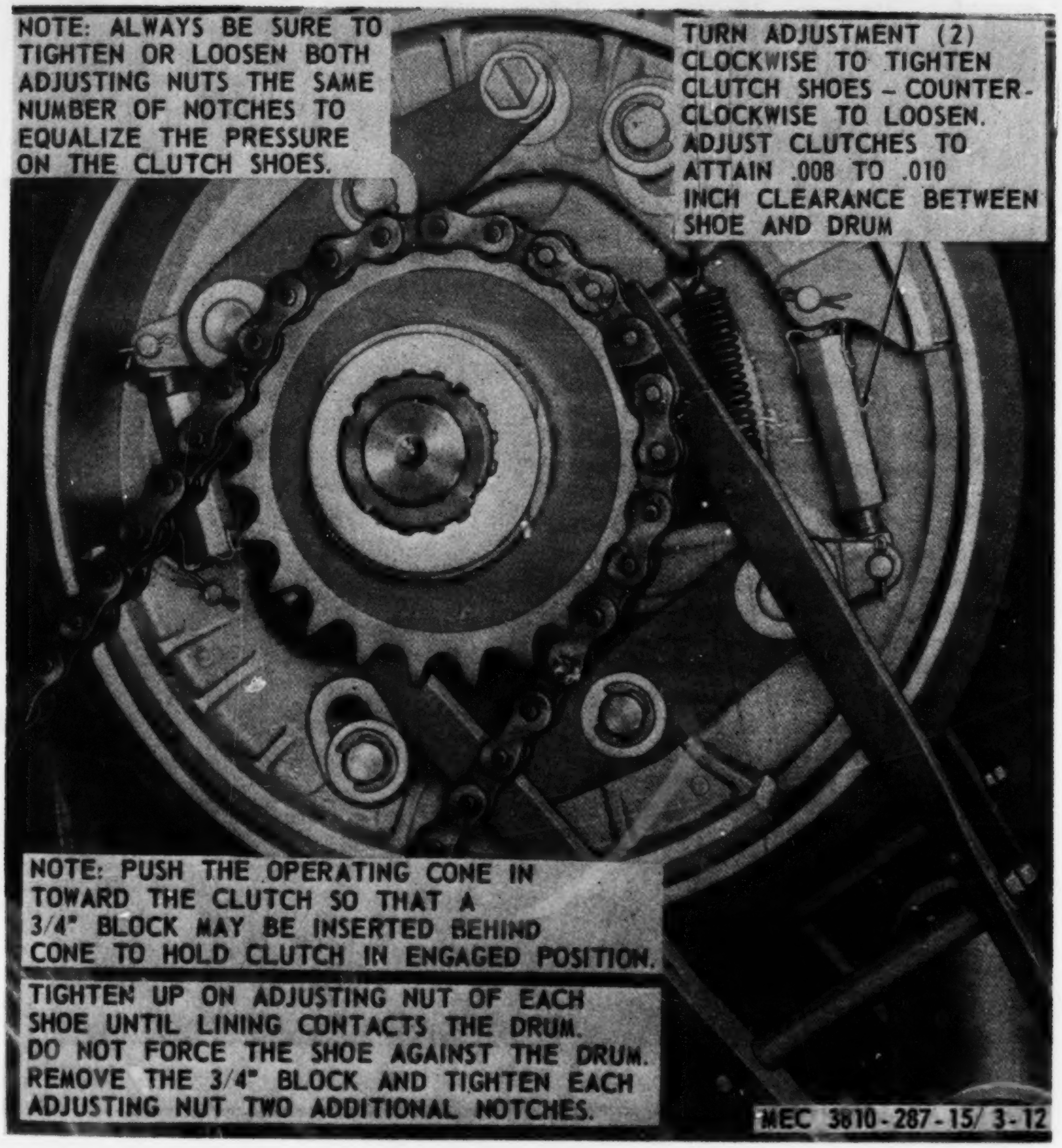

ENGINE DRIVEN SPROCKET
RIGHT SWING CLUTCH
LEFT HOIST CLUTCH
BOOM HOIST CLUTCH
RIGHT HOIST CLUTCH
LEFT SWING CLUTCH
MEC 3810-287-15/3-11

Figure 3-11. Clutch shaft assembly



NOTE: ALWAYS BE SURE TO TIGHTEN OR LOOSEN BOTH ADJUSTING NUTS THE SAME NUMBER OF NOTCHES TO EQUALIZE THE PRESSURE ON THE CLUTCH SHOES.

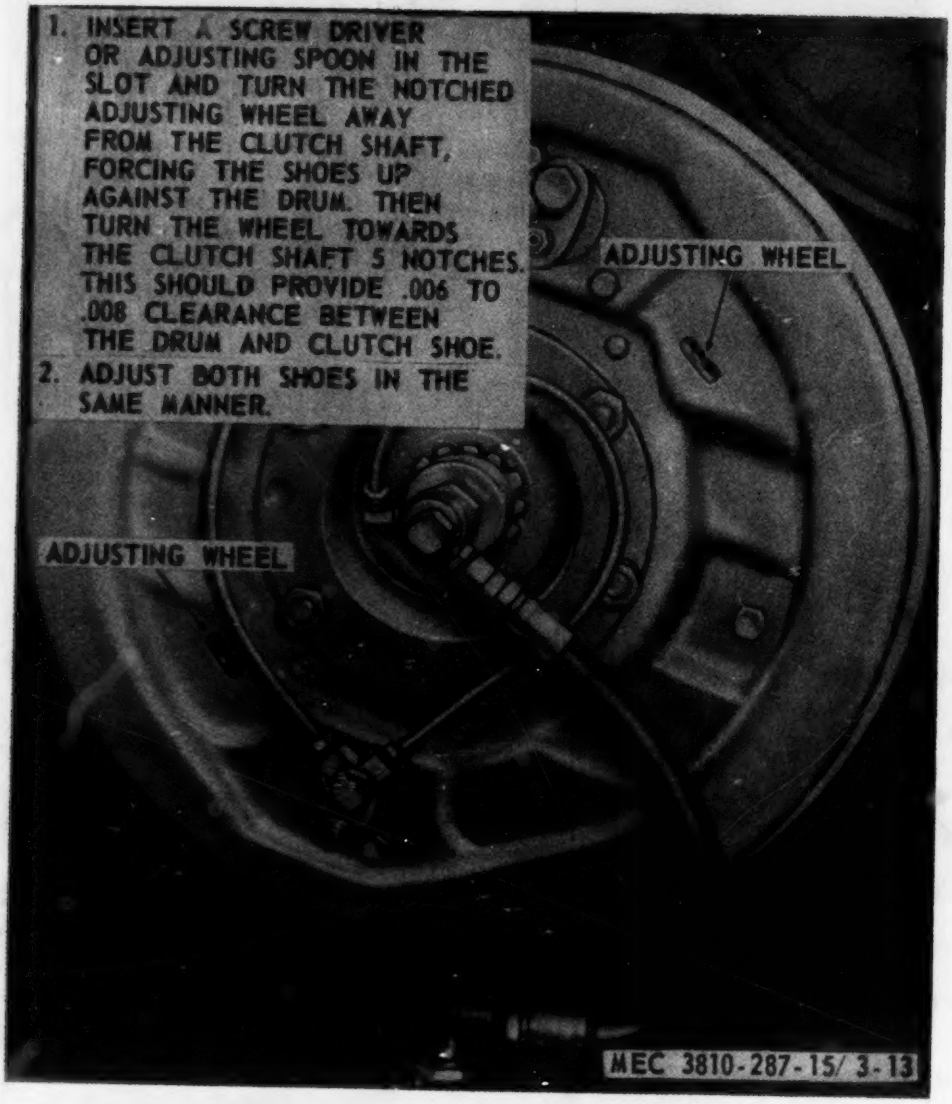
TURN ADJUSTMENT (2) CLOCKWISE TO TIGHTEN CLUTCH SHOES – COUNTER-CLOCKWISE TO LOOSEN. ADJUST CLUTCHES TO ATTAIN .008 TO .010 INCH CLEARANCE BETWEEN SHOE AND DRUM

NOTE: PUSH THE OPERATING CONE IN TOWARD THE CLUTCH SO THAT A 3/4" BLOCK MAY BE INSERTED BEHIND CONE TO HOLD CLUTCH IN ENGAGED POSITION.

TIGHTEN UP ON ADJUSTING NUT OF EACH SHOE UNTIL LINING CONTACTS THE DRUM. DO NOT FORCE THE SHOE AGAINST THE DRUM. REMOVE THE 3/4" BLOCK AND TIGHTEN EACH ADJUSTING NUT TWO ADDITIONAL NOTCHES.

MEC 3810-287-15/3-12

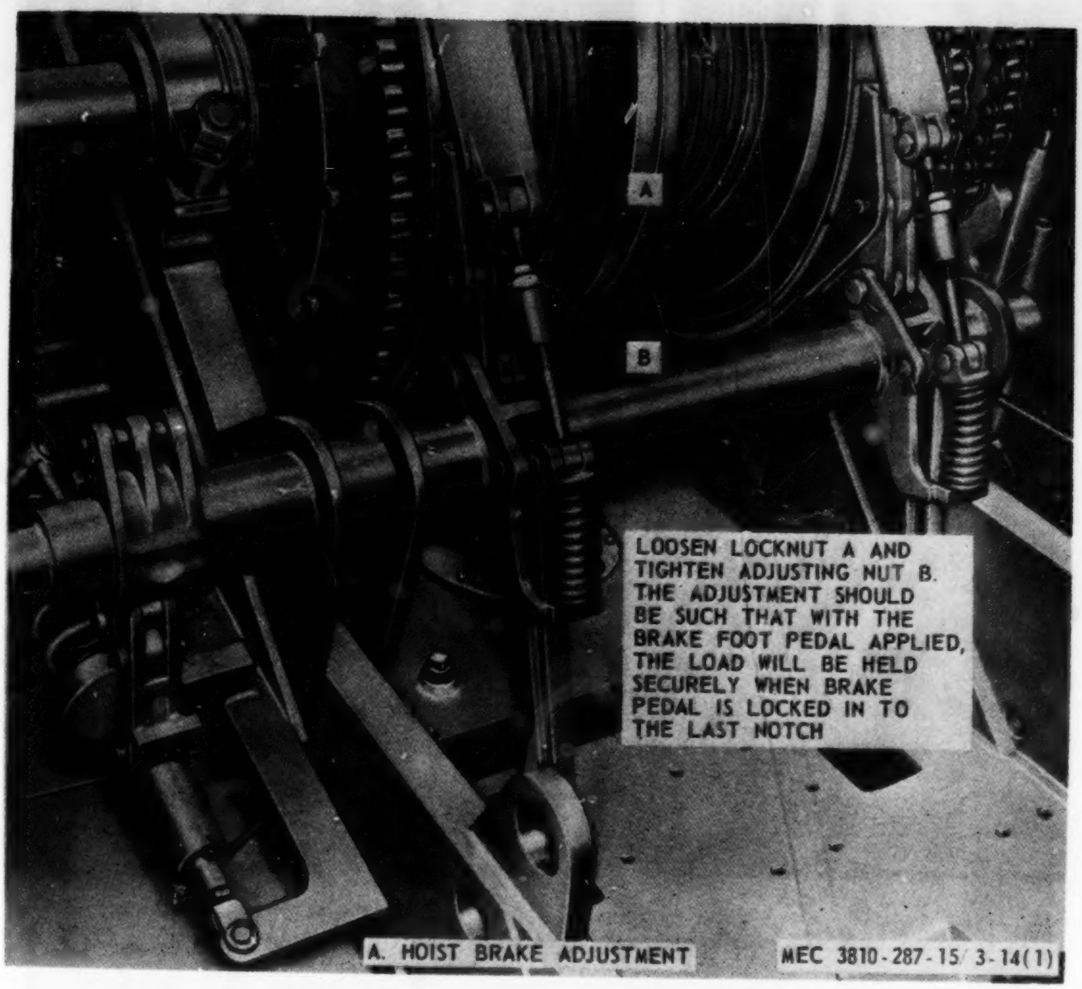
Figure 3-12. Clutch shaft clutch adjustment.



1. INSERT A SCREW DRIVER OR ADJUSTING SPOON IN THE SLOT AND TURN THE NOTCHED ADJUSTING WHEEL AWAY FROM THE CLUTCH SHAFT, FORCING THE SHOES UP AGAINST THE DRUM. THEN TURN THE WHEEL TOWARDS THE CLUTCH SHAFT 5 NOTCHES. THIS SHOULD PROVIDE .006 TO .008 CLEARANCE BETWEEN THE DRUM AND CLUTCH SHOE.
2. ADJUST BOTH SHOES IN THE SAME MANNER.

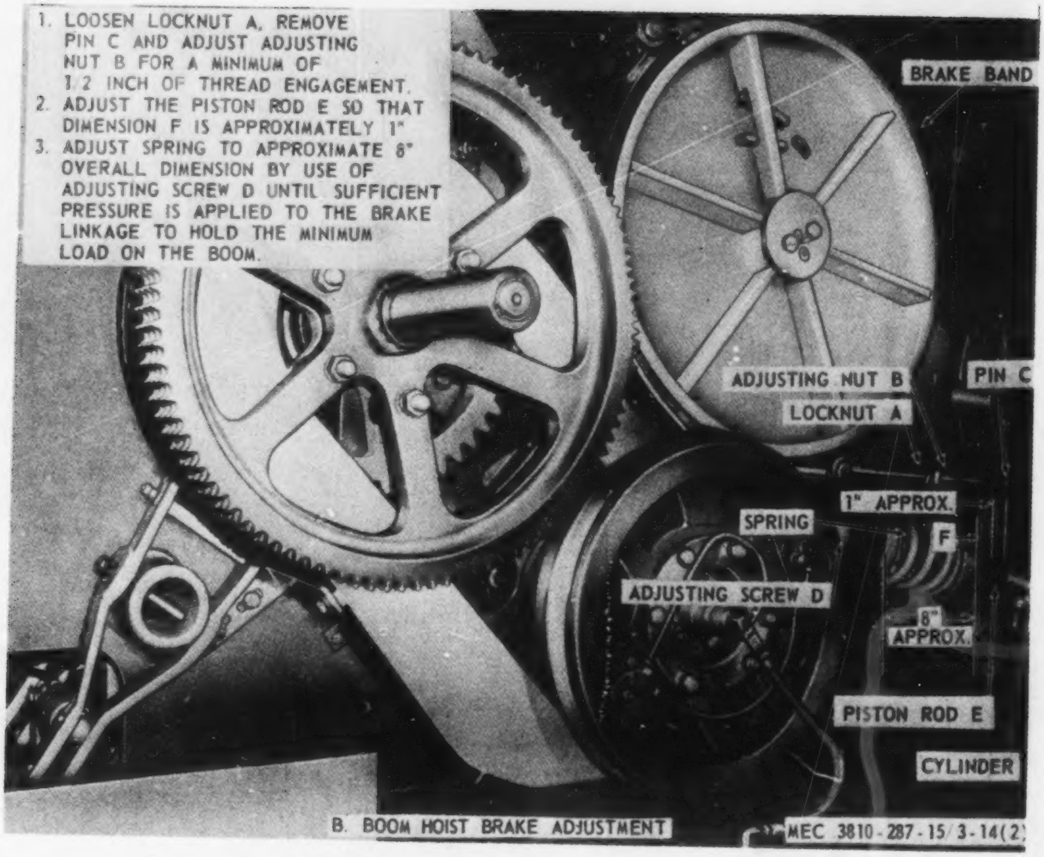
ADJUSTING WHEEL
ADJUSTING WHEEL
MEC 3810-287-15/ 3-13

Figure 3-13. Power boom lowering and power load lowering clutch adjustment.



A
B
LOOSEN LOCKNUT A AND TIGHTEN ADJUSTING NUT B. THE ADJUSTMENT SHOULD BE SUCH THAT WITH THE BRAKE FOOT PEDAL APPLIED, THE LOAD WILL BE HELD SECURELY WHEN BRAKE PEDAL IS LOCKED IN TO THE LAST NOTCH
A. HOIST BRAKE ADJUSTMENT
MEC 3810-287-15/3-14(1)

Figure 3-14 (1). Hoist, boom hoist and third drum brake adjustment.



1. LOOSEN LOCKNUT A. REMOVE PIN C AND ADJUST ADJUSTING NUT B FOR A MINIMUM OF 1/2 INCH OF THREAD ENGAGEMENT.
2. ADJUST THE PISTON ROD E SO THAT DIMENSION F IS APPROXIMATELY 1"
3. ADJUST SPRING TO APPROXIMATE 8" OVERALL DIMENSION BY USE OF ADJUSTING SCREW D UNTIL SUFFICIENT PRESSURE IS APPLIED TO THE BRAKE LINKAGE TO HOLD THE MINIMUM LOAD ON THE BOOM.

BRAKE BAND
ADJUSTING NUT B
PIN C
LOCKNUT A
1" APPROX.
F
SPRING
ADJUSTING SCREW D
8" APPROX.
PISTON ROD E
CYLINDER
MEC 3810-287-15/3-14(2)

B. BOOM HOIST BRAKE ADJUSTMENT

Figure 3-14 (2).—Continued.

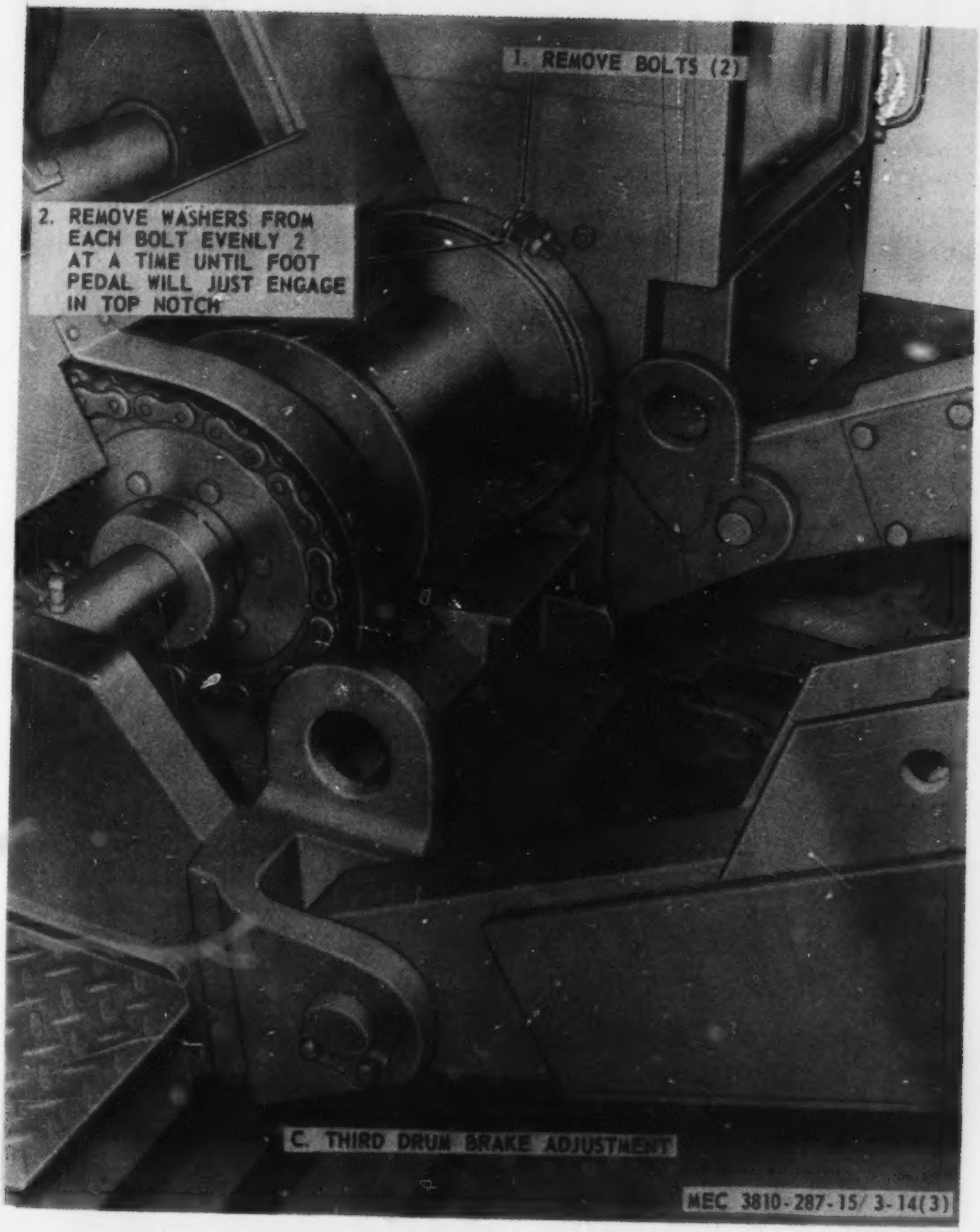
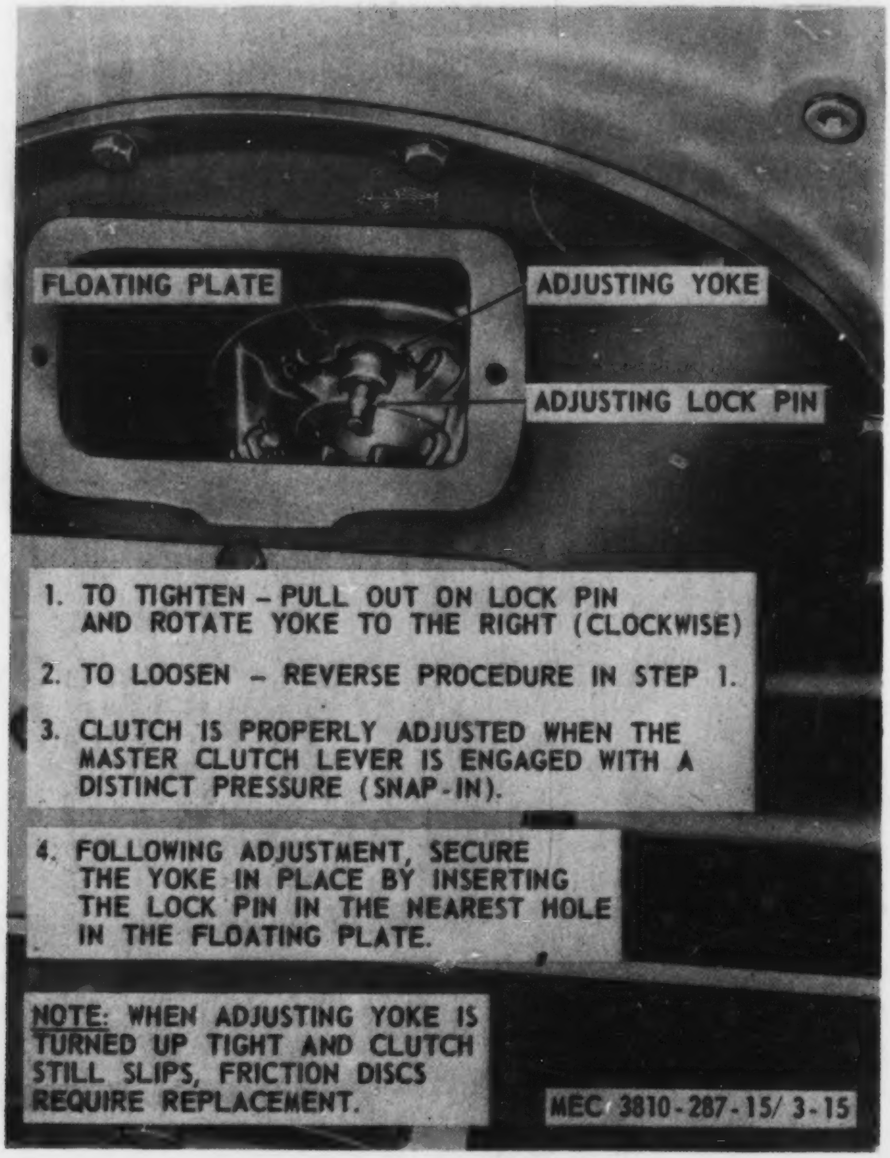

1. REMOVE BOLTS (2)
2. REMOVE WASHERS FROM EACH BOLT EVENLY 2 AT A TIME UNTIL FOOT PEDAL WILL JUST ENGAGE IN TOP NOTCH
C. THIRD DRUM BRAKE ADJUSTMENT
MEC 3810-287-15/ 3-14(3)

Figure 3-14 (3).—Continued.


FLOATING PLATE
ADJUSTING YOKE
ADJUSTING LOCK PIN
MEC 3810-287-15/3-15

1. TO TIGHTEN – PULL OUT ON LOCK PIN AND ROTATE YOKE TO THE RIGHT (CLOCKWISE)
2. TO LOOSEN – REVERSE PROCEDURE IN STEP 1.
3. CLUTCH IS PROPERLY ADJUSTED WHEN THE MASTER CLUTCH LEVER IS ENGAGED WITH A DISTINCT PRESSURE (SNAP-IN).
4. FOLLOWING ADJUSTMENT, SECURE THE YOKE IN PLACE BY INSERTING THE LOCK PIN IN THE NEAREST HOLE IN THE FLOATING PLATE.

NOTE: WHEN ADJUSTING YOKE IS TURNED UP TIGHT AND CLUTCH STILL SLIPS, FRICTION DISCS REQUIRE REPLACEMENT.

Figure 3-15. Engine clutch adjustment.

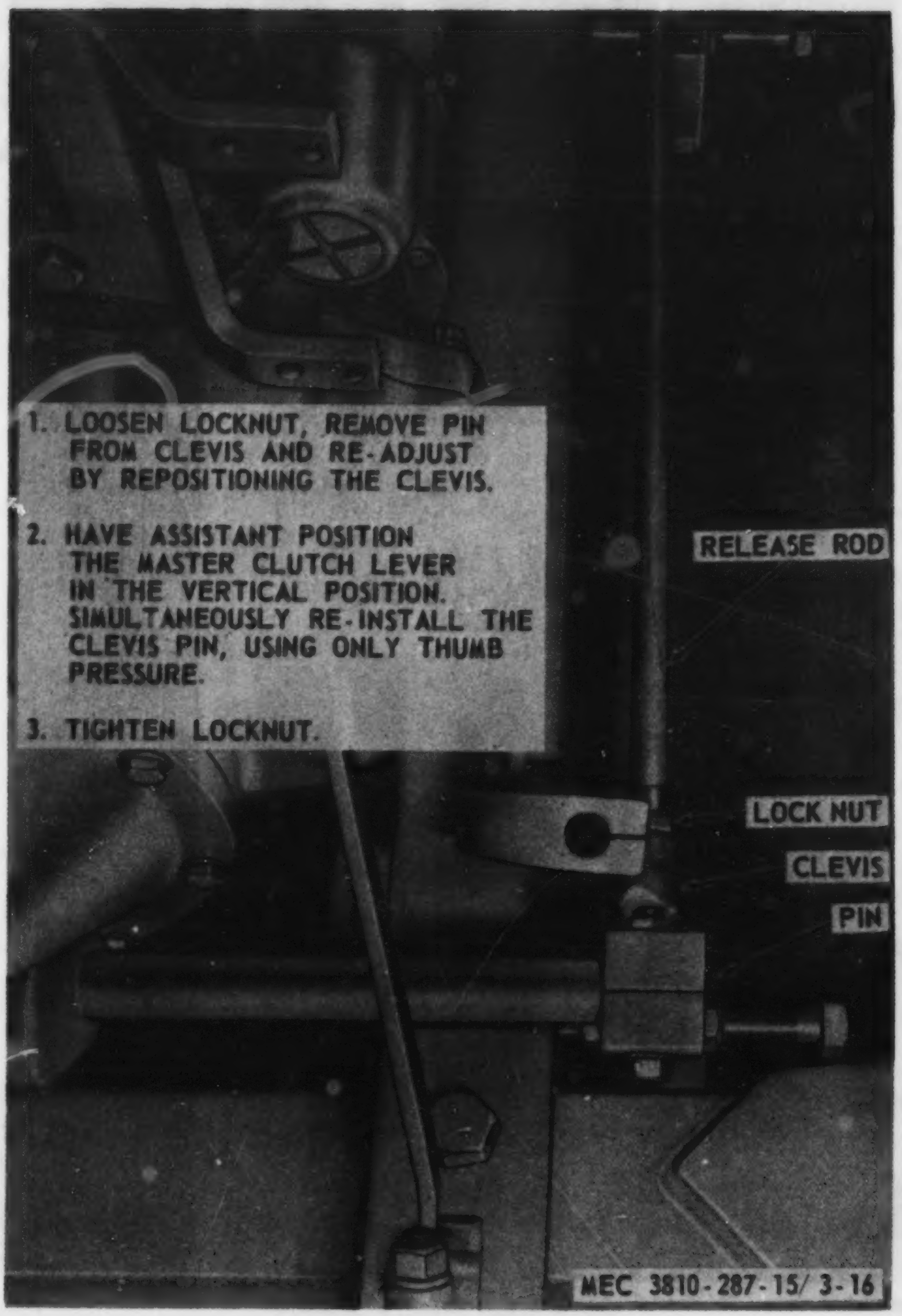

1. LOOSEN LOCKNUT, REMOVE PIN FROM CLEVIS AND RE-ADJUST BY REPOSITIONING THE CLEVIS.
2. HAVE ASSISTANT POSITION THE MASTER CLUTCH LEVER IN THE VERTICAL POSITION. SIMULTANEOUSLY RE-INSTALL THE CLEVIS PIN, USING ONLY THUMB PRESSURE.
3. TIGHTEN LOCKNUT.
RELEASE ROD
LOCK NUT
CLEVIS
PIN
MEC 3810-287-15/ 3-16

Figure 3-16. Engine clutch release mechanism adjustment.

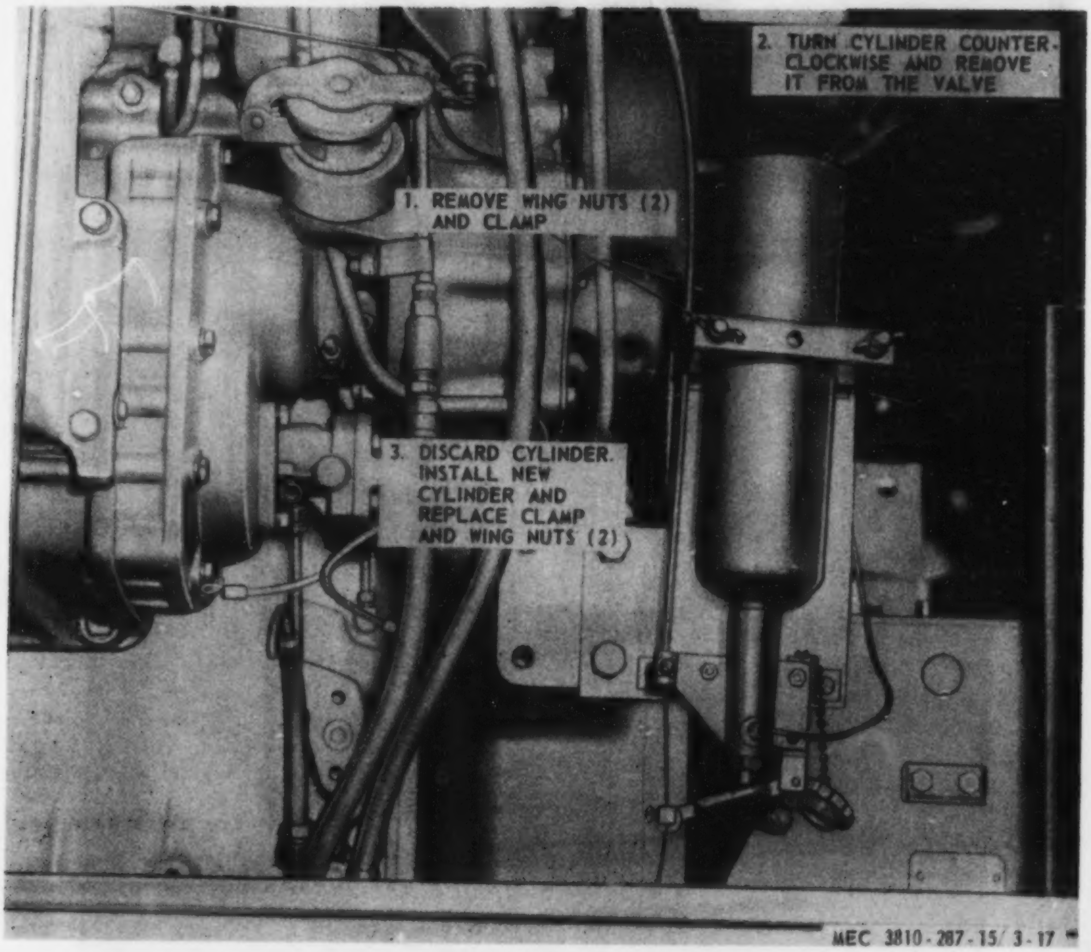

2. TURN CYLINDER COUNTERCLOCKWISE AND REMOVE IT FROM THE VALVE
1. REMOVE WING NUTS (2) AND CLAMP
3. DISCARD CYLINDER. INSTALL NEW CYLINDER AND REPLACE CLAMP AND WING NUTS (2)
MEC 3810-287-15/3-17

Figure 3–17. Cold weather starting aid service.

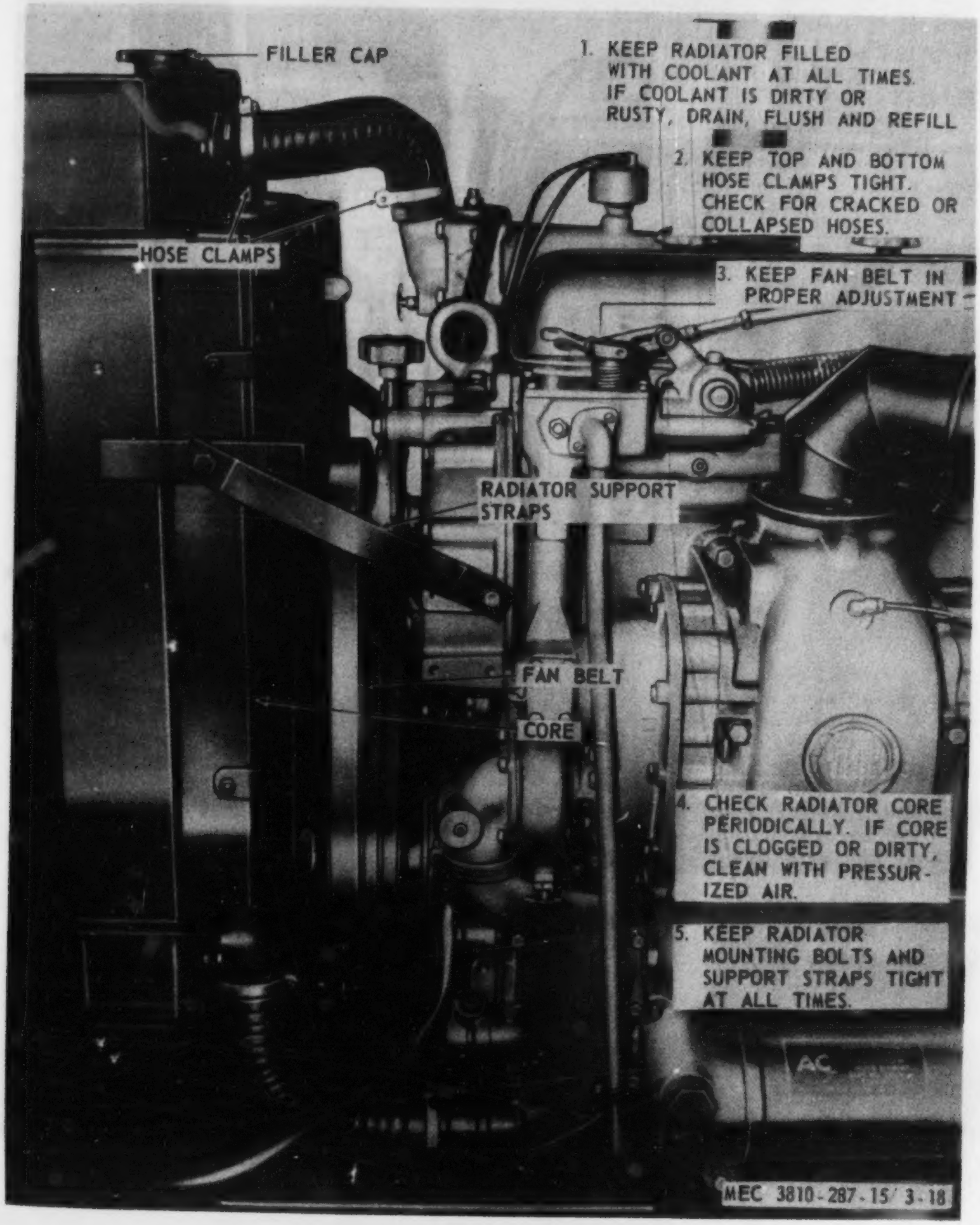

FILLER CAP
1. KEEP RADIATOR FILLED WITH COOLANT AT ALL TIMES. IF COOLANT IS DIRTY OR RUSTY, DRAIN, FLUSH AND REFILL
2. KEEP TOP AND BOTTOM HOSE CLAMPS TIGHT. CHECK FOR CRACKED OR COLLAPSED HOSES.
HOSE CLAMPS
3. KEEP FAN BELT IN PROPER ADJUSTMENT
RADIATOR SUPPORT STRAPS
FAN BELT
CORE
4. CHECK RADIATOR CORE PERIODICALLY. IF CORE IS CLOGGED OR DIRTY, CLEAN WITH PRESSURIZED AIR.
5. KEEP RADIATOR MOUNTING BOLTS AND SUPPORT STRAPS TIGHT AT ALL TIMES.
MEC 3810-287-15/3-18

Figure 3-18. Cooling System Service.

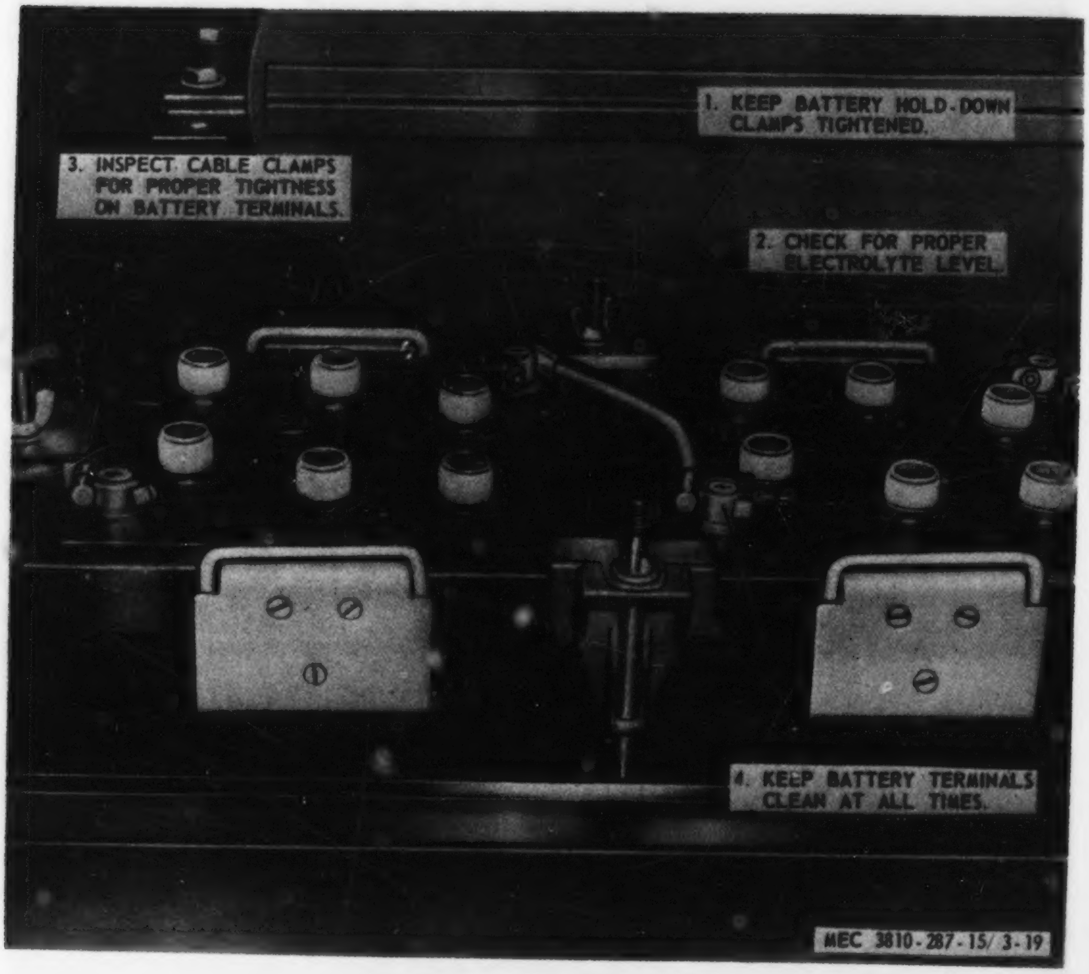
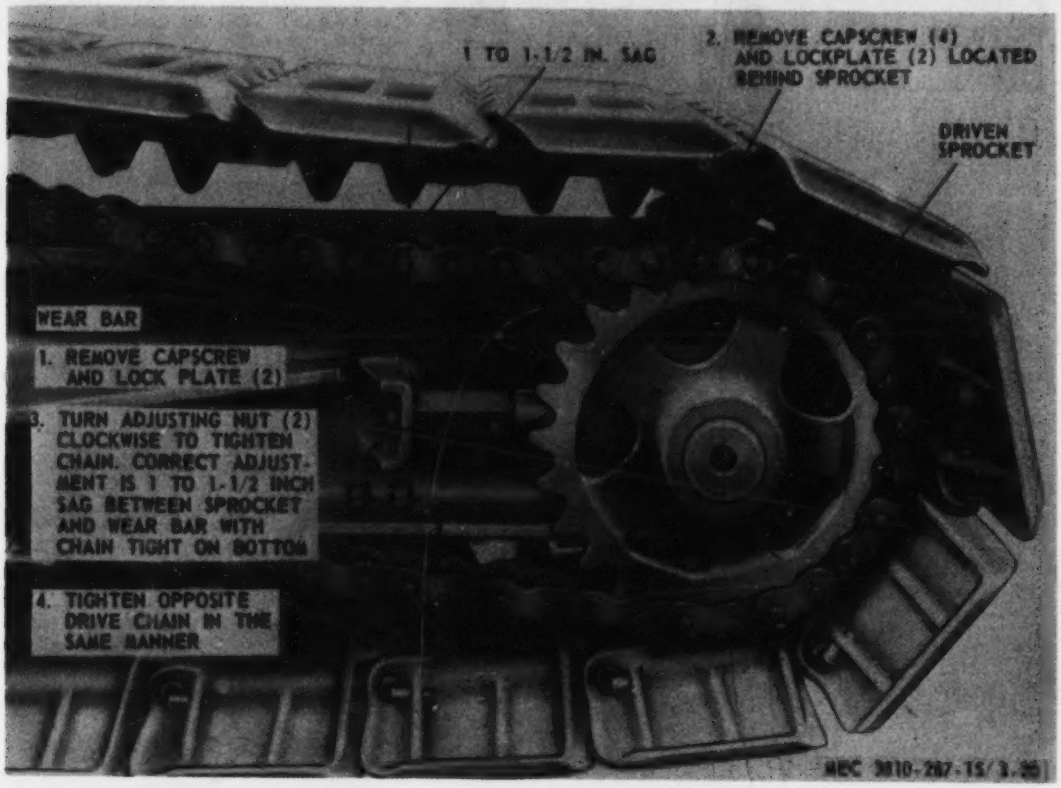

1. KEEP BATTERY HOLD-DOWN CLAMPS TIGHTENED.
2. CHECK FOR PROPER ELECTROLYTE LEVEL.
3. INSPECT CABLE CLAMPS FOR PROPER TIGHTNESS ON BATTERY TERMINALS.
4. KEEP BATTERY TERMINALS CLEAN AT ALL TIMES.
MEC 3810-287-15/3-19

Figure 3-19. Battery service.



1 TO 1-1/2 IN. SAG
DRIVEN SPROCKET
WEAR BAR

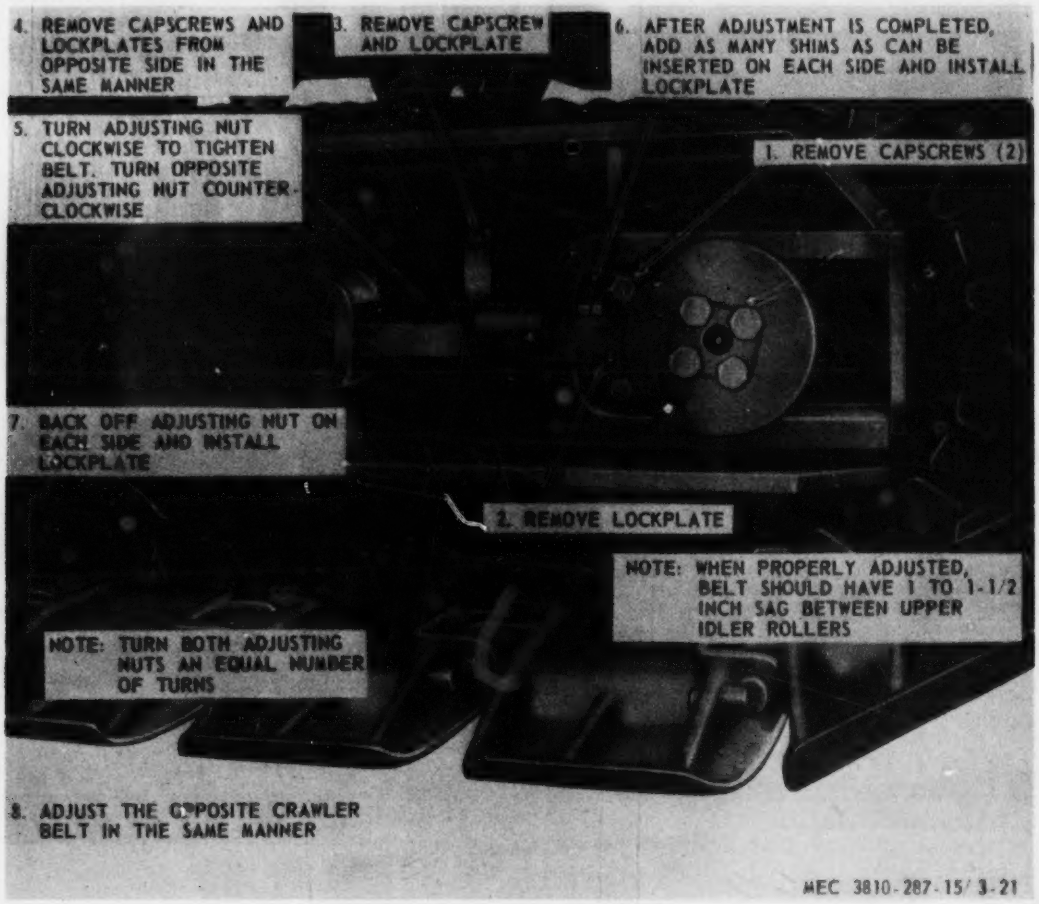
1. REMOVE CAPSCREW AND LOCK PLATE (2)

2. REMOVE CAPSCREW (4) AND LOCKPLATE (2) LOCATED BEHIND SPROCKET

3. TURN ADJUSTING NUT (2) CLOCKWISE TO TIGHTEN CHAIN. CORRECT ADJUSTMENT IS 1 TO 1-1/2 INCH SAG BETWEEN SPROCKET AND WEAR BAR WITH CHAIN TIGHT ON BOTTOM

4. TIGHTEN OPPOSITE DRIVE CHAIN IN THE SAME MANNER

MEC 3810-287-15/3-20



1. REMOVE CAPSCREWS (2)

2. REMOVE LOCKPLATE

3. REMOVE CAPSCREW AND LOCKPLATE

4. REMOVE CAPSCREWS AND LOCKPLATES FROM OPPOSITE SIDE IN THE SAME MANNER

5. TURN ADJUSTING NUT CLOCKWISE TO TIGHTEN BELT. TURN OPPOSITE ADJUSTING NUT COUNTER-CLOCKWISE

6. AFTER ADJUSTMENT IS COMPLETED, ADD AS MANY SHIMS AS CAN BE INSERTED ON EACH SIDE AND INSTALL LOCKPLATE

7. BACK OFF ADJUSTING NUT ON EACH SIDE AND INSTALL LOCKPLATE

8. ADJUST THE OPPOSITE CRAWLER BELT IN THE SAME MANNER

NOTE: TURN BOTH ADJUSTING NUTS AN EQUAL NUMBER OF TURNS

NOTE: WHEN PROPERLY ADJUSTED, BELT SHOULD HAVE 1 TO 1-1/2 INCH SAG BETWEEN UPPER IDLER ROLLERS

MEC 3810-287-15/3-21

Figure 3-21. Crawler belt adjustment.

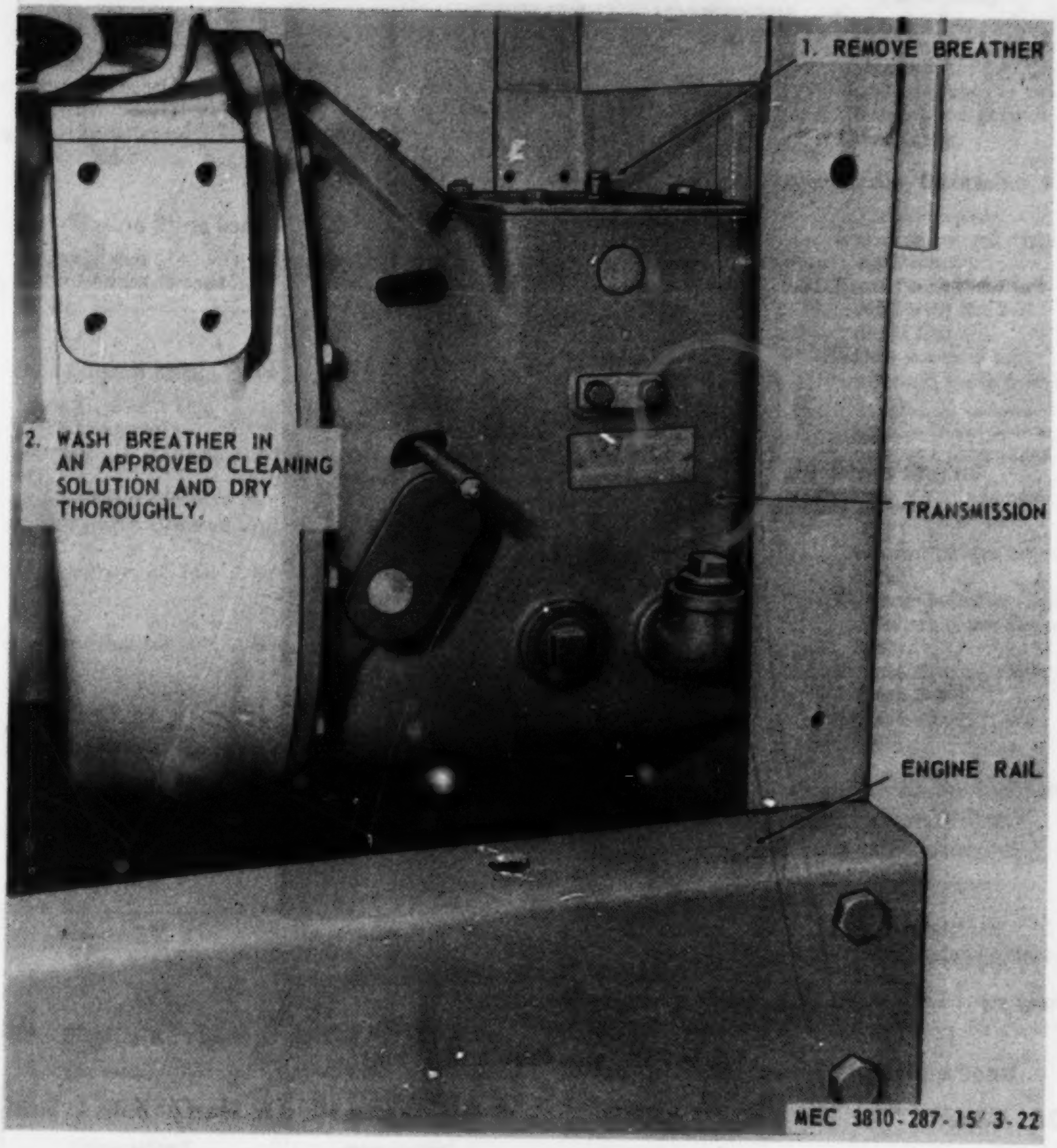

1. REMOVE BREATHER
2. WASH BREATHER IN AN APPROVED CLEANING SOLUTION AND DRY THOROUGHLY.
TRANSMISSION
ENGINE RAIL
MEC 3810-287-15/3-22

Figure 3-22. Transmission breather service.

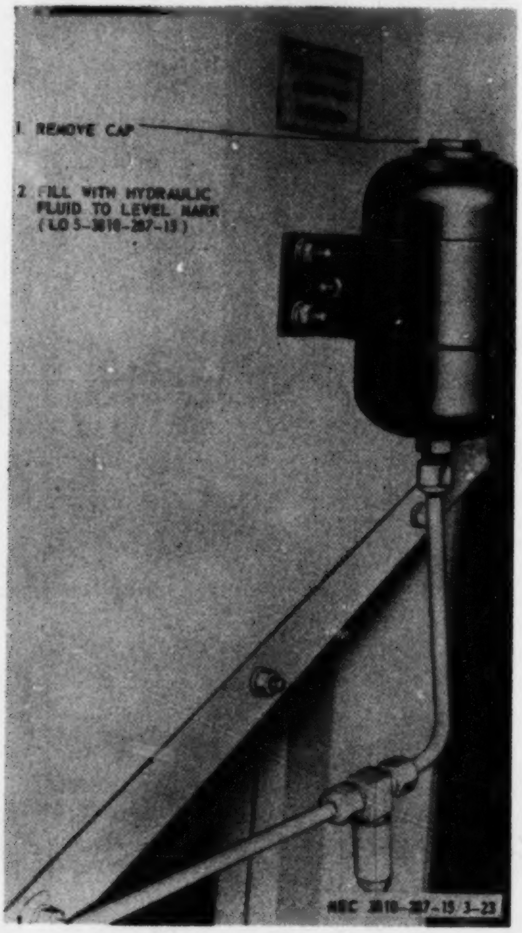

1. REMOVE CAP
2. FILL WITH HYDRAULIC FLUID TO LEVEL MARK (LO 5-3810-287-15)
MEC 3810-287-15/3-23

Figure 3-23. Master cylinder service.

Section V. Troubleshooting

3-25. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the Lorain crane-shovel and its components. Each trouble symptom stated is followed by a list of probable causes. The possible remedy recommended is described opposite the probable cause. Any trouble beyond the scope of organizational maintenance shall be reported to direct support maintenance.

3-26. Engine Hard to Start or Fails to Start

Probable cause	Possible remedy
Fuel supply low	**Fill fuel tank (para 3-55).**
Low temperature	**Use low temperature starting aid (para 3-51.)**
Injectors out of adjustment	**Adjust injectors (para 3-48).**

3-27. Engine Overheats

Probable cause	Possible remedy
Radiator coolant level low	**Check coolant level and refill if necessary (para 3-56).**

Probable cause	Possible remedy
V-belts broken, loose, or slipping	Adjust or replace belts (para 3–61).
Defective thermostat	Replace thermostat (para 3–59).
Defective or collapsed radiator hose	Replace hose (para 3–56).
Engine overheating	Inspect cooling system and temperature gage for proper operation. Clean cooling system or replace temperature gage of thermostat.

3–28. Engine Runs too Cold

Probable cause	Possible remedy
Thermostat stuck in open position	Replace thermostat (para 3–59).

3–29. Engine Lacks Power

Probable cause	Possible remedy
Injectors improperly adjusted	Adjust injectors (para 3–49).
Engine governor defective or improperly adjusted	Adjust or replace governor (para 3–50).
Improper grade of fuel	Drain and refill fuel tank with proper grade fuel (para 3–55).
Engine running too cold	Check and replace thermostat if defevtive (para 3–59).

3–30. Engine Knocks or Develops Sudden Noise

Probable cause	Possible remedy
Oil level low	Check oil level and fill to level mark on dipstick (para 3–6).
Loss of oil	Inspect engine oil pan, valve cover and filters for leaks or damage. Repair leaks.

3–31. Engine has Low or no Oil Pressure

Probable cause	Possible remedy
Oil level low	Check oil level and add oil as required (para 6).
Improper grade oil for ambient temperature	Drain and refill with proper grade oil (LO 5–3810–287–15).

3–32. Engine Oil Consumption High

Probable cause	Possible remedy
Worn piston rings	Report to general support maintenance.
Improper grade oil	Drain and refill with proper grade oil. (LO 5–3810–15).

3–33. Engine Exhaust Smoke Excessive

Probable cause	Possible remedy
Worn piston rings	Report to general support maintenance.
Wrong grade of fuel	Drain fuel system and refill with No. 2–D diesel fuel.
Governor control rod setting out of adjustment or injectors out of time.	Adjust governor and injectors (para 3–49 and 3–50).

3–34. Starter Fails to Crank Engine

Probable cause	Possible remedy
Loose battery terminals or connections	Clean and tighten connections.
Batteries low or defective	Recharge batteries. Replace defective batteries (para 3–67).
Starting motor defective	Replace starting motor (para 3–65).
Starter switch defective	Replace switch (para 3–66).

3–35. Battery-Charging Ammeter Indicates Low or no Charging Rate When Batteries are Low or Discharged

Probable cause	Possible remedy
Loose battery terminals or connections	Clean and tighten terminals and connections.
Alternator defective	Replace alternator (para. 3–63).

3–36. Hoist Brakes will not Hold Load

Probable cause	Possible remedy
Brakes improperly adjusted	Adjust brakes (para 3–15).
Brake lining worn	Replace lining (para 3–98).
Brake pedal linkage improperly adjusted	Adjust linkage (para 3–15).

3–37. Hoist Clutches will not Raise Load

Probable cause	Possible remedy
Clutches improperly adjusted	Adjust clutches (para 3–13).
Lining worn	Replace lining (para 3–98).

3-38. Boom Hoist Brake Slips

Probable cause	Possible remedy
Brake improperly adjusted	Adjust brake (para 3-15).
Lining worn	Replace lining (para 3-98).

3-39. Swing Clutches Slip

Probable cause	Possible remedy
Clutches improperly adjusted	Adjust clutches (para 3-12).
Lining worn	Replace lining (para 7-3).

3-40. Crawler Belts Jump Drive Sprockets

Probable cause	Possible remedy
Crawler belts loose	Tighten crawler belts (para 3-21).
Crawler belts improperly adjusted	Adjust crawler belts (para 3-21).

3-41. Crawler Does not Steer Straight

Probable cause	Possible remedy
Crawler belts not adjusted equally	Adjust crawler belts (para 3-21).
Drive sprocket and idler roller bearings worn	Report to general support maintenance.

Section VI. RADIO INTERFERENCE SUPPRESSION

3-42. Definitions

a. Interference. The term "interference" as used herein applies to electrical disturbances in the radio frequency range which are generated by the (end item nomenclature) and which may interfere with the proper operation of radio receivers or other electronic equipment, or enable the enemy to locate the equipment.

b. Interference Suppression. The term "interference suppression" as used herein applies to the methods used to eliminate or effectively reduce radio interference generated by the (end item nomenclature).

3-43. General Methods Used to Attain Proper Suppression

Essentially, suppression is attained by providing a low resistance path to ground stray currents. Methods used include shielding the ignition and high-frequency wires, grounding the frame with bonding straps, and using capacitors and resistors.

Note. Do not pull on cable or twist braided shielding. Gently work cable from side to side and free the rubber seal. Do not use sharp metal tools to install rubber seals.

3-44. Interference Suppression Components

a. Primary Suppression Components. The primary suppression components are those whose primary function is to suppress radio interference. These components are described and located in figure 3-24.

b. Secondary Suppression Components. These components have radio interference suppression functions which are incidental and/or secondary to their primary function.

3-45. Replacement of Supression Components

Refer to figure 3-24 and replace radio interference suppression components.

3-46. Testing of Radio Interference Suppression Components

Test the capacitors for leaks and shorts on a capacitor tester; replace defective capacitors. If test equipment is not available and interference is indicated, isolate cause by the trial-and-error method of replacing each capacitor in turn until the cause of interference is located and eliminated.

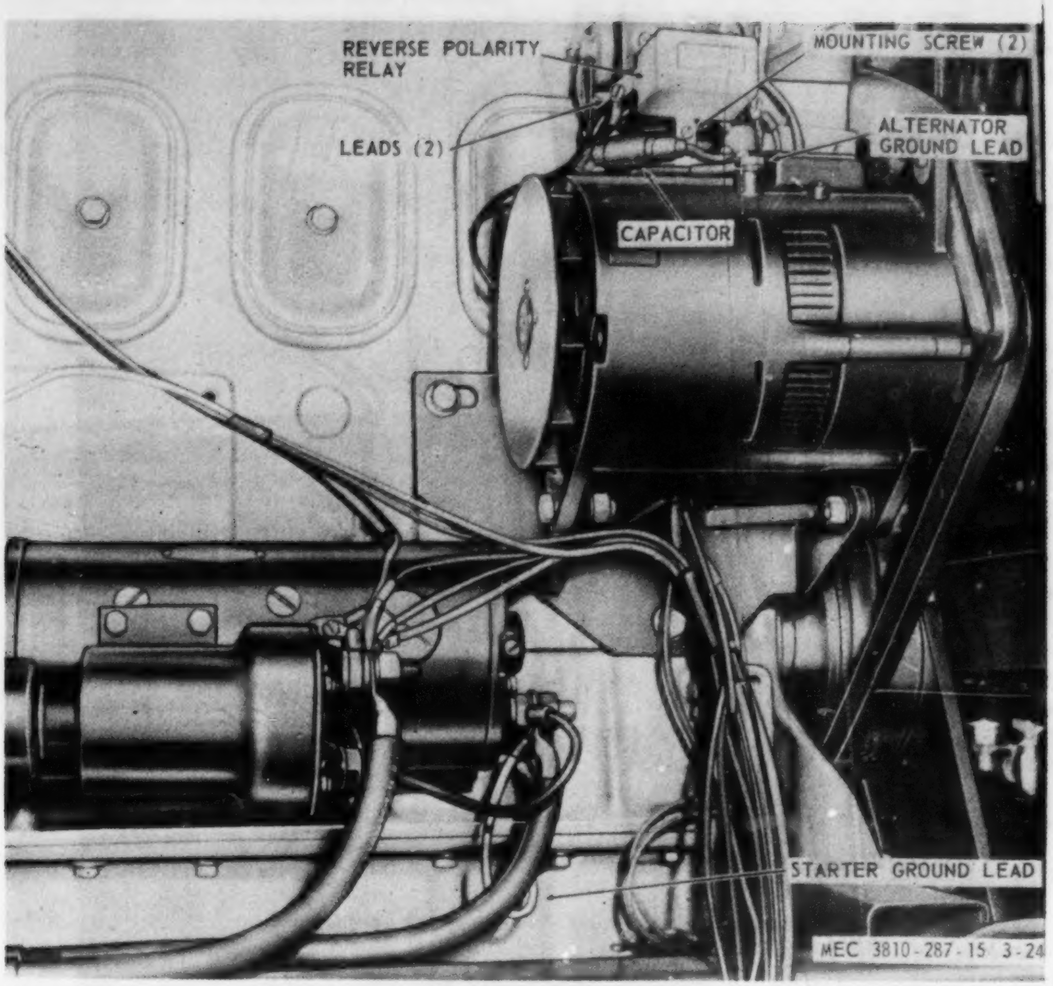

REVERSE POLARITY RELAY
MOUNTING SCREW (2)
LEADS (2)
ALTERNATOR GROUND LEAD
CAPACITOR
STARTER GROUND LEAD
MEC 3810-287-15 3-24

Figure 3-24. Replacement of suppression components.

Section VII. FUEL SYSTEM

3-47. Rocker Arm Cover

a. General. The rocker arm cover is located on the engine cylinder head and houses the rocker arms, injectors, and governor control tube.

b. Removal. Remove the rocker arm cover as instructed on figure 3-25.

c. Cleaning. Clean the rocker arm cover with an approved cleaning solvent and dry thoroughly.

d. Inspection and Repair. Inspect for dents and distortion which might prevent the cover from seating and sealing properly. Straighten dents. Replace a badly damaged rocker arm cover.

e. Installation. Install the rocker arm cover in reverse of the instructions on figure 3-25.

Note. Install a new rocker arm cover gasket each time the cover is removed.

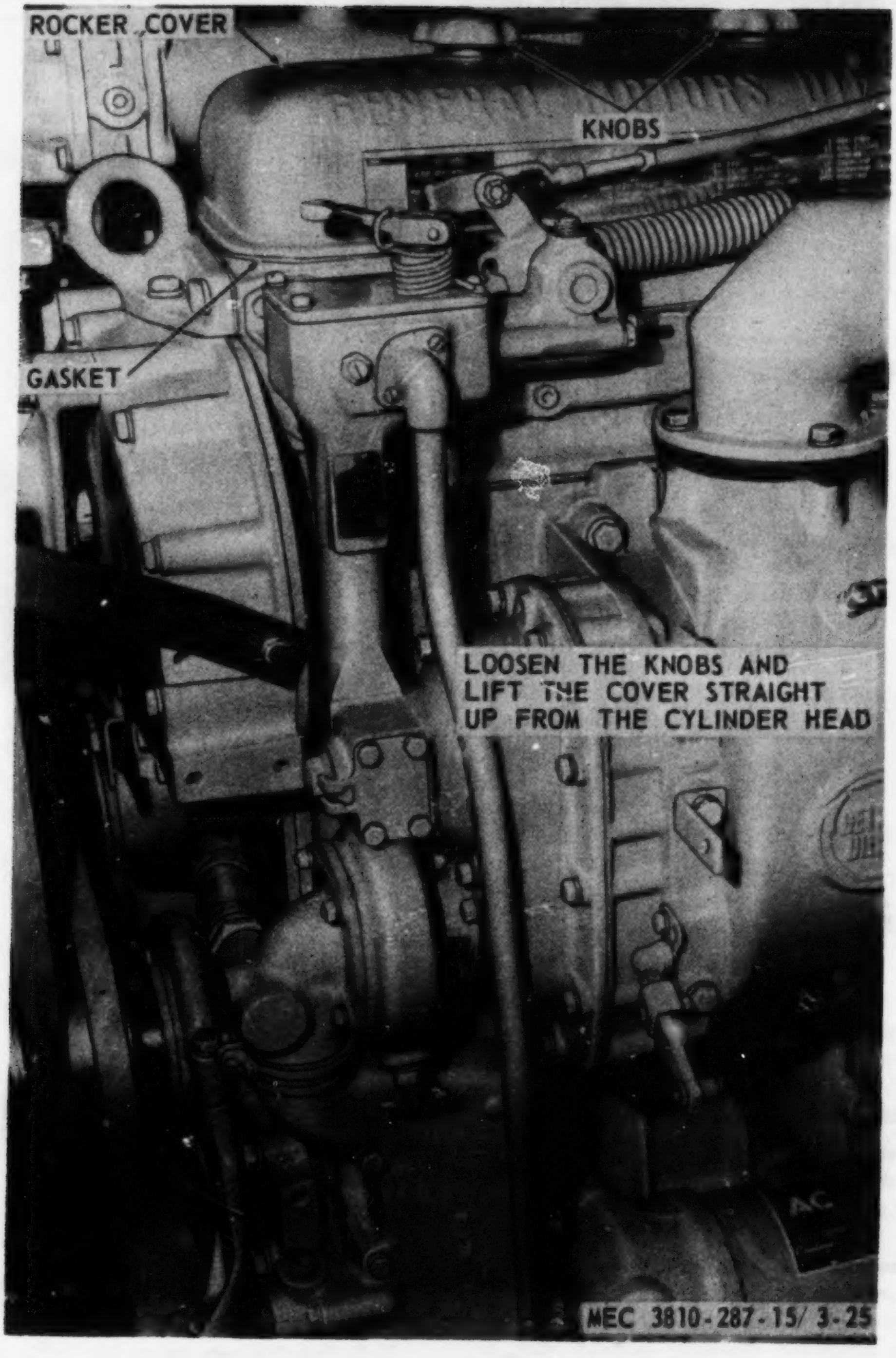

ROCKER COVER
KNOBS
GASKET
LOOSEN THE KNOBS AND LIFT THE COVER STRAIGHT UP FROM THE CYLINDER HEAD
MEC 3810-287-15/ 3-25

Figure 3-25. Rocker arm cover, removal and installation.

3–48. Exhaust Valve Rocker Arm Assembly

a. General. The rocker arm assembly is mounted on top of the cylinder head assembly and enclosed by the rocker arm cover. The rocker arms are actuated by the camshaft through push rods, which, in turn, actuate the exhaust valves.

b. Adjustment.

(1) Remove the rocker arm cover (para 3–45).

(2) Refer to figure 3–26 and adjust the rocker arms.

(3) Install the rocker arm cover (para 3–45).

3–49. Injector Rocker Arm Assembly

a. General. The injector rocker arms are located on top of the cylinder head between the valve rocker arms, and enclosed by the rocker arm cover. The injector rocker arms are actuated by the camshaft through push rods, which, in turn, actuate the injectors.

b. Adjustment.

(1) Remove the rocker arm cover (para 3–45).

(2) Refer to figure 3–27 and adjust the injector rocker arms.

Note. Use General Motors timing gage Number J–1853 with a dimension of 1.460 inch when adjusting the injector rocker arms.

3–50. Governor

a. General. The governor assembly is located on the left front corner of the engine and attached to the cylinder head and blower housing. It is of variable speed design and maintains engine rpm under varying conditions.

b. Removal. Remove the governor assembly as instructed on figure 3–28.

c. Installation. Install the governor assembly in reverse of the instructions on figure 3–28.

d. Adjustment.

Note. Governor adjustments must be made simultaneously with the adjustment of valves, injectors, and the control rod assembly. Do not adjust the governor unless a complete tune up is being accomplished.

(1) Adjust the exhaust valve rocker arm assemblies (para 3–46).

(2) Adjust the injector rocker arm assemblies (para 3–47).

(3) Refer to figure 3–29 and adjust the governor and injector control levers.

3–51. Cold Weather Starting Aid Assembly

a. General. The cold weather starting aid is located on the left hand side of the engine and is designed to inject a small quantity of ether into the engine to facilitate starting. It is equipped with a pressurized cartridge which can be replaced when empty.

b. Removal. Remove the cold weather starting aid assembly as instructed on figure 3–30.

c. Installation. Install the cold weather starting aid assembly in reverse of the instructions on figure 3–30.

3–52. Throttle Controls

a. General. The throttle controls are located between the operator's compartment and the engine. They consist of linkage and levers and provide remote control of the engine governor assembly which, in turn, controls the engine speed.

b. Removal. Remove the throttle controls as instructed on figure 3–31.

c. Installation. Install the throttle controls in reverse of the instructions on figure 3–31.

3–53. Air Cleaner

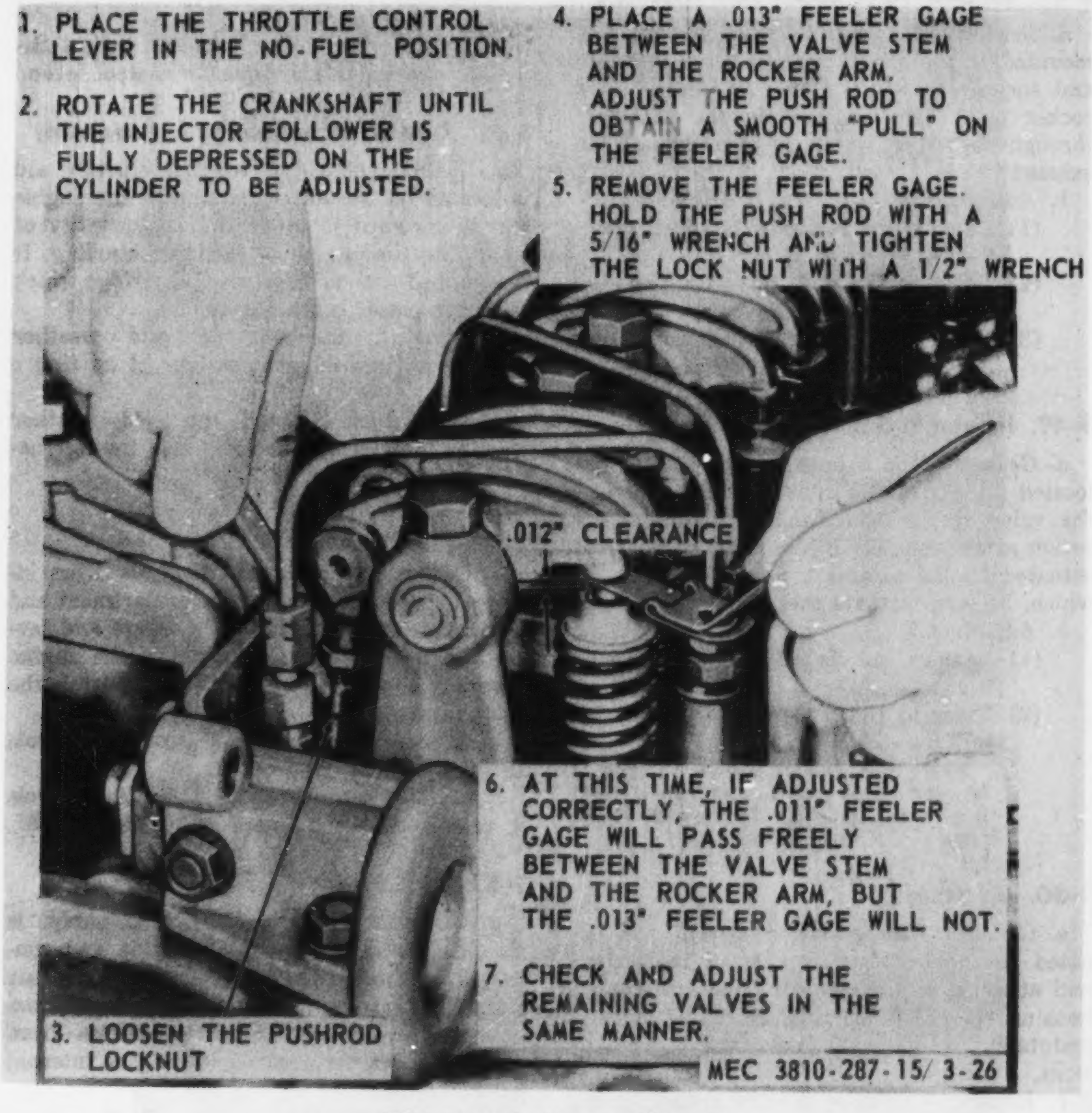
a. General. The air cleaner assembly is mounted at the rear of the engine and connected to the blower inlet housing. The air cleaner filters the air before it enters the engine to prevent dust and dirt particles from creating excessive wear on the engine internal parts.

b. Removal. Refer to figure 3–32 and remove the air cleaner assembly.

c. Disassembly. Disassemble the air cleaner assembly as instructed on figure 3–33.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for damage. Inspect hose for deterioration. Repair or replace all damaged parts. Replace deteriorated hose.



1. PLACE THE THROTTLE CONTROL LEVER IN THE NO-FUEL POSITION.
2. ROTATE THE CRANKSHAFT UNTIL THE INJECTOR FOLLOWER IS FULLY DEPRESSED ON THE CYLINDER TO BE ADJUSTED.
3. LOOSEN THE PUSHROD LOCKNUT
4. PLACE A .013" FEELER GAGE BETWEEN THE VALVE STEM AND THE ROCKER ARM. ADJUST THE PUSH ROD TO OBTAIN A SMOOTH "PULL" ON THE FEELER GAGE.
5. REMOVE THE FEELER GAGE. HOLD THE PUSH ROD WITH A 5/16" WRENCH AND TIGHTEN THE LOCK NUT WITH A 1/2" WRENCH
6. AT THIS TIME, IF ADJUSTED CORRECTLY, THE .011" FEELER GAGE WILL PASS FREELY BETWEEN THE VALVE STEM AND THE ROCKER ARM, BUT THE .013" FEELER GAGE WILL NOT.
7. CHECK AND ADJUST THE REMAINING VALVES IN THE SAME MANNER.

Figure 3-26. Rocker arm adjustment.

f. Reassembly. Reassemble the air cleaner assembly in reverse of the instructions on figure 3-33.

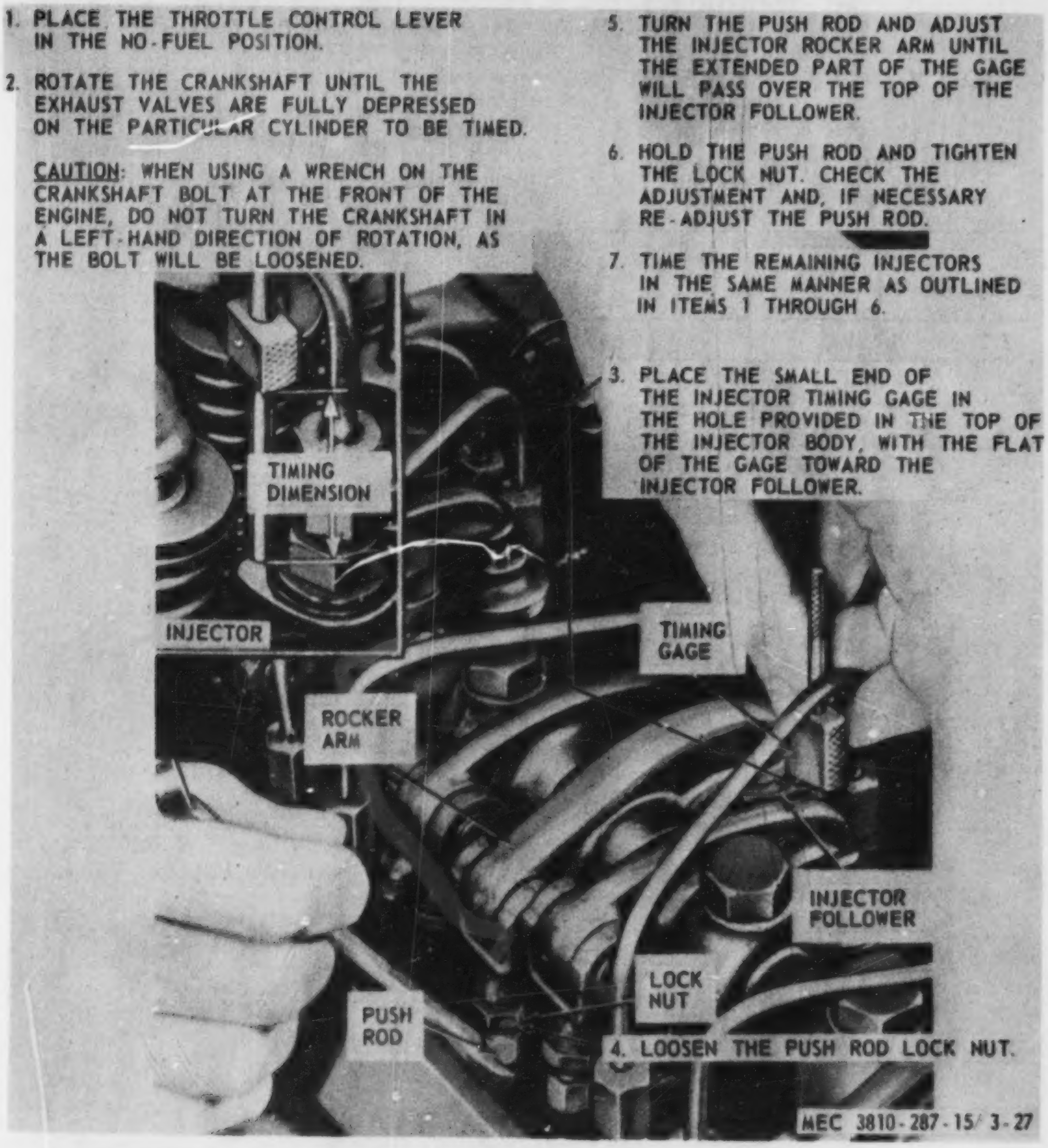
g. Installation. Install the air cleaner in reverse of the instructions on figure 3-32.

3-54. Fuel Filters

a. General. The fuel filters are mounted on the left rear of the engine and attached to the engine block assembly. They are connected between the fuel transfer pump and the injectors to eliminate dirt and sediment from clogging the injectors.

b. Removal. Refer to figure 3-34 and remove the fuel filter assemblies.

c. Disassembly. Disassemble the fuel filters as instructed on figure 3-35.



1. PLACE THE THROTTLE CONTROL LEVER IN THE NO-FUEL POSITION.
2. ROTATE THE CRANKSHAFT UNTIL THE EXHAUST VALVES ARE FULLY DEPRESSED ON THE PARTICULAR CYLINDER TO BE TIMED.

CAUTION: WHEN USING A WRENCH ON THE CRANKSHAFT BOLT AT THE FRONT OF THE ENGINE, DO NOT TURN THE CRANKSHAFT IN A LEFT-HAND DIRECTION OF ROTATION, AS THE BOLT WILL BE LOOSENED.

3. PLACE THE SMALL END OF THE INJECTOR TIMING GAGE IN THE HOLE PROVIDED IN THE TOP OF THE INJECTOR BODY, WITH THE FLAT OF THE GAGE TOWARD THE INJECTOR FOLLOWER.
4. LOOSEN THE PUSH ROD LOCK NUT.
5. TURN THE PUSH ROD AND ADJUST THE INJECTOR ROCKER ARM UNTIL THE EXTENDED PART OF THE GAGE WILL PASS OVER THE TOP OF THE INJECTOR FOLLOWER.
6. HOLD THE PUSH ROD AND TIGHTEN THE LOCK NUT. CHECK THE ADJUSTMENT AND, IF NECESSARY RE-ADJUST THE PUSH ROD.
7. TIME THE REMAINING INJECTORS IN THE SAME MANNER AS OUTLINED IN ITEMS 1 THROUGH 6.

Figure 3-27. Injector rocker arm adjustment.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect for missing or damaged parts. Replace gaskets, filter elements, and damaged parts.

f. Reassembly. Reassemble the fuel filters in reverse of the instructions on figure 3-35.

g. Installation. Install the fuel filter assemblies in reverse of the instructions on figure 3-34.

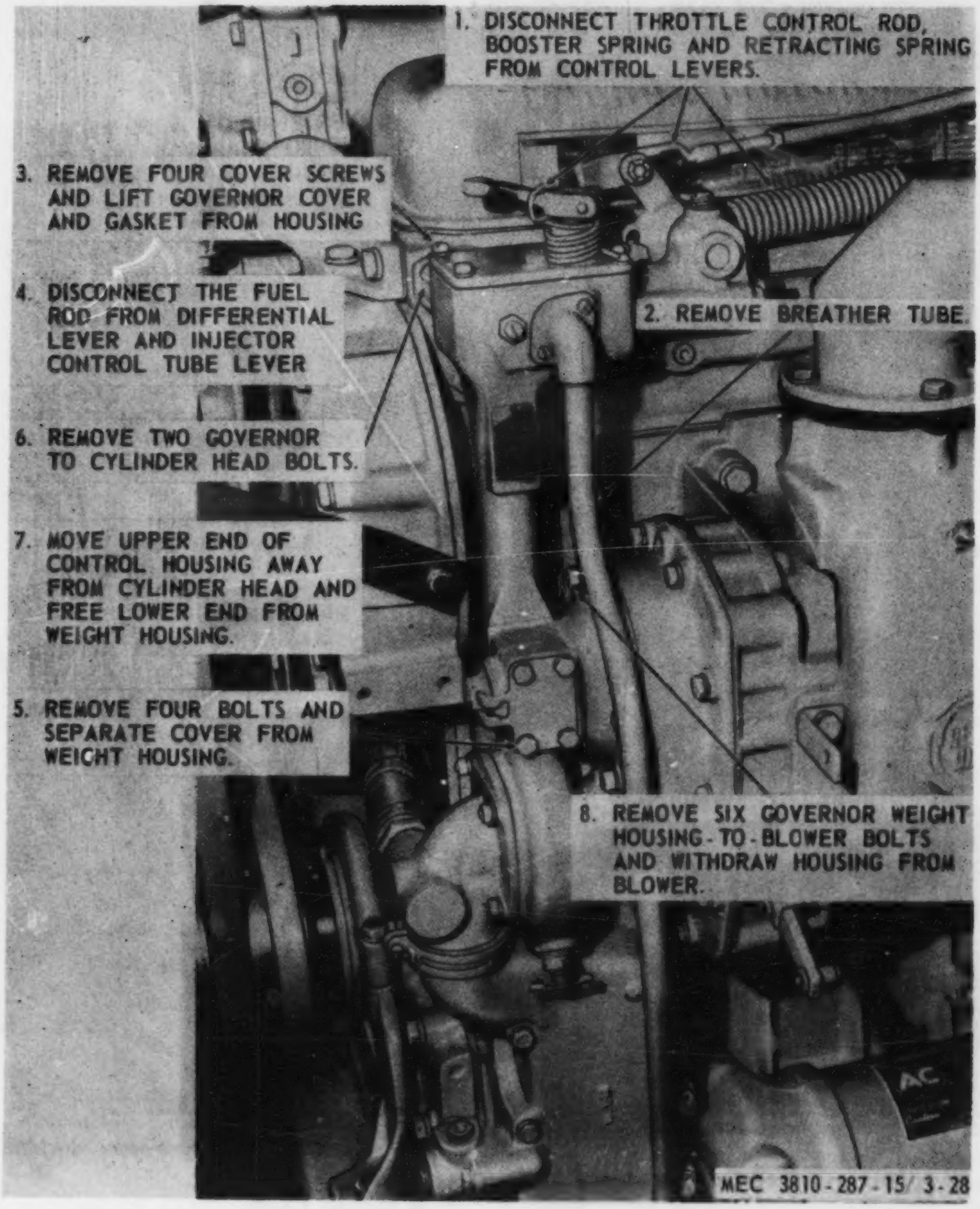

1. DISCONNECT THROTTLE CONTROL ROD, BOOSTER SPRING AND RETRACTING SPRING FROM CONTROL LEVERS.
3. REMOVE FOUR COVER SCREWS AND LIFT GOVERNOR COVER AND GASKET FROM HOUSING
4. DISCONNECT THE FUEL ROD FROM DIFFERENTIAL LEVER AND INJECTOR CONTROL TUBE LEVER
2. REMOVE BREATHER TUBE.
6. REMOVE TWO GOVERNOR TO CYLINDER HEAD BOLTS.
7. MOVE UPPER END OF CONTROL HOUSING AWAY FROM CYLINDER HEAD AND FREE LOWER END FROM WEIGHT HOUSING.
5. REMOVE FOUR BOLTS AND SEPARATE COVER FROM WEIGHT HOUSING.
8. REMOVE SIX GOVERNOR WEIGHT HOUSING-TO-BLOWER BOLTS AND WITHDRAW HOUSING FROM BLOWER.
AC
MEC 3810-287-15/3-28

Figure 3-28. Governor assembly, removal and installation.

3-55. Fuel Tank, Lines and Fittings

a. General. The fuel tank assembly is located in the left rear corner of the turntable bed directly below the transmission. It has a capacity of 50 gallons of fuel.

b. Removal. Refer to figure 3-36 and remove the fuel tank, lines, and fittings.

c. Cleaning. Clean the fuel tank with an approved cleaning solution. Use live steam when available.

Caution: **Do not smoke or allow open flame near fuel tank as it may explode causing severe injury.**

d. Inspection. Inspect the tank for leaks and damage. Replace damaged lines and fittings.

e. Installation. Install the fuel tank, lines, and fittings in reverse of the instructions on figure 3-36.

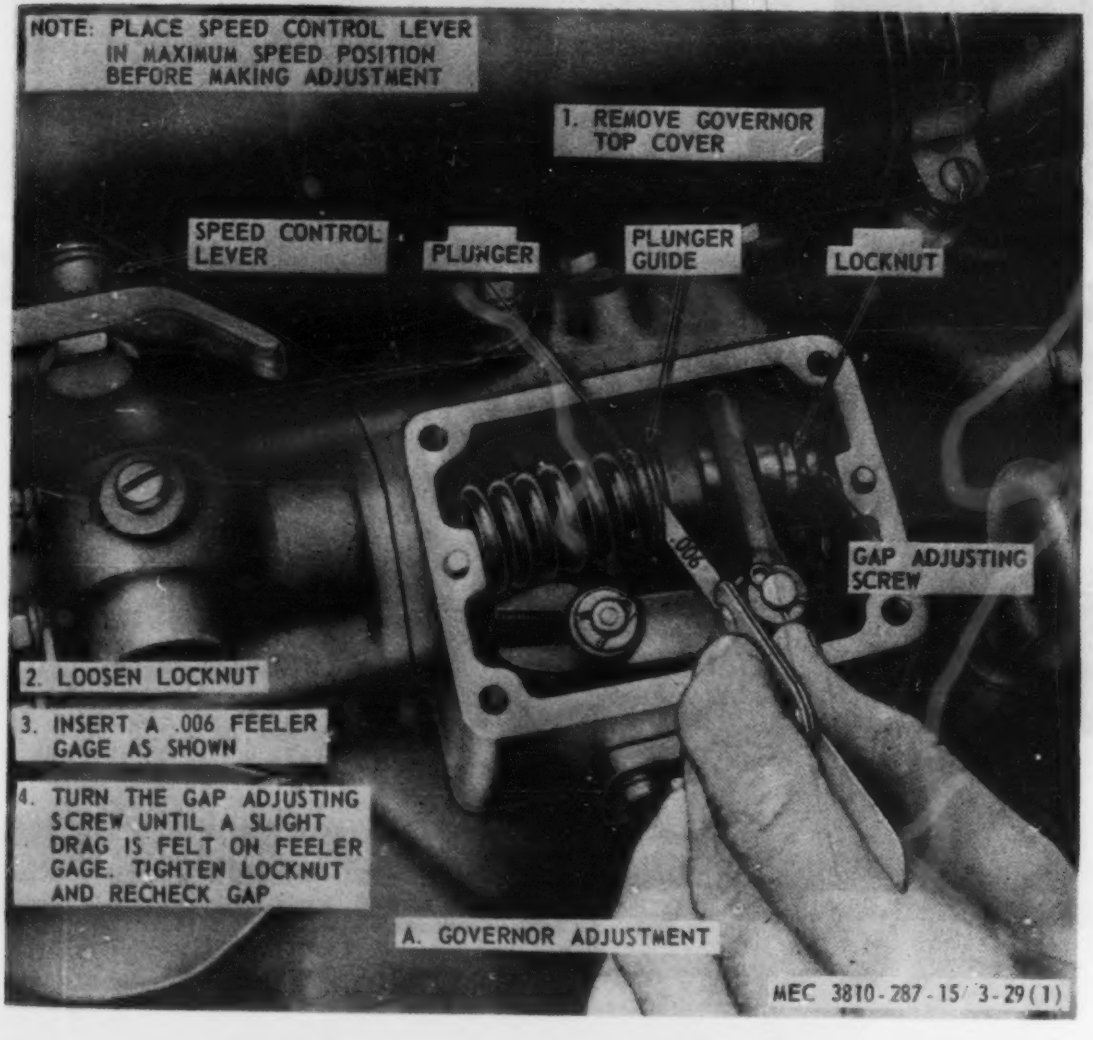

NOTE: PLACE SPEED CONTROL LEVER IN MAXIMUM SPEED POSITION BEFORE MAKING ADJUSTMENT
1. REMOVE GOVERNOR TOP COVER
SPEED CONTROL LEVER
PLUNGER
PLUNGER GUIDE
LOCKNUT
.006
GAP ADJUSTING SCREW
2. LOOSEN LOCKNUT
3. INSERT A .006 FEELER GAGE AS SHOWN
4. TURN THE GAP ADJUSTING SCREW UNTIL A SLIGHT DRAG IS FELT ON FEELER GAGE. TIGHTEN LOCKNUT AND RECHECK GAP
A. GOVERNOR ADJUSTMENT
MEC 3810-287-15/3-29(1)

Figure 3-29 (1). Governor and injector control lever adjustments.

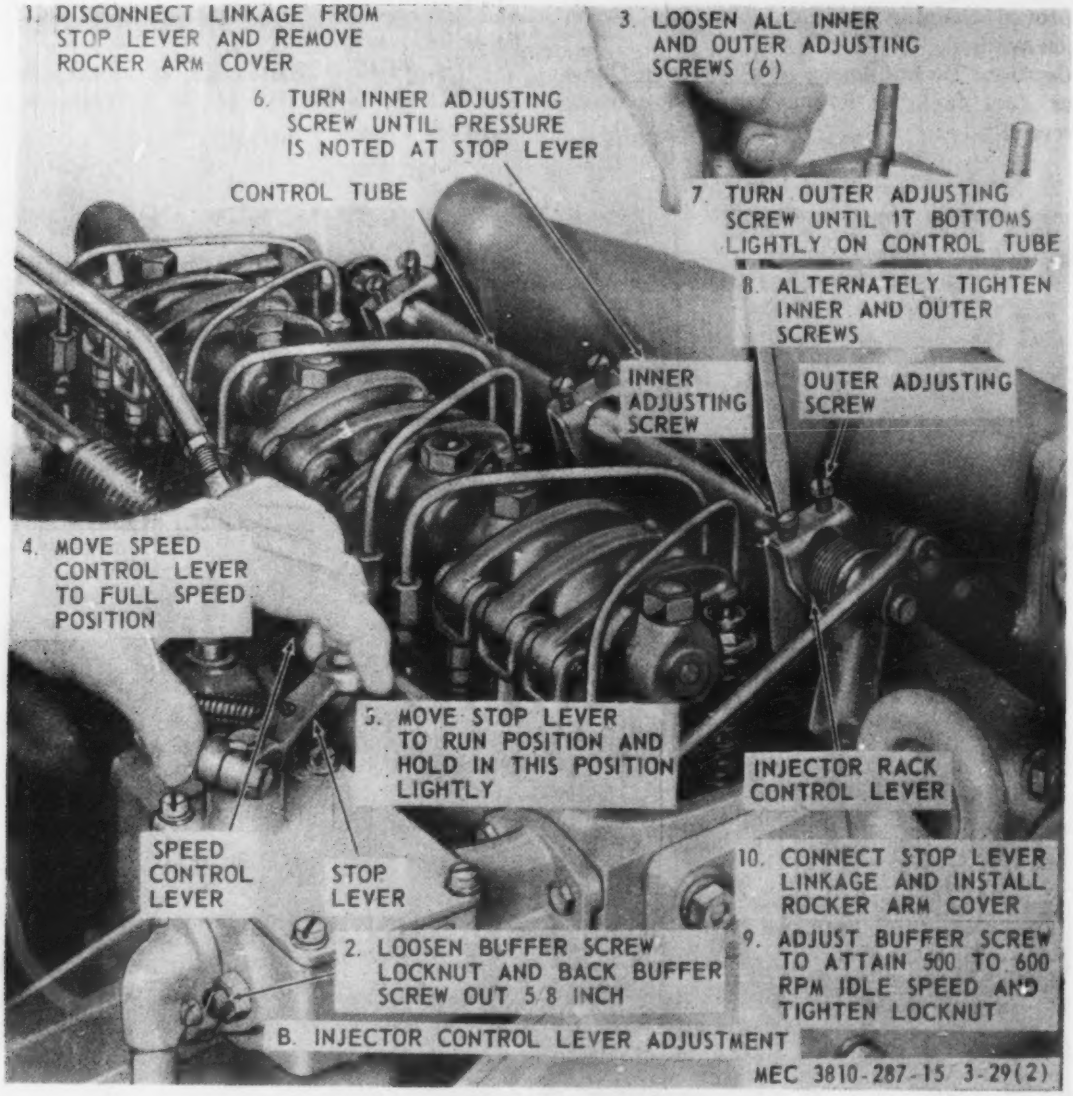

1. DISCONNECT LINKAGE FROM STOP LEVER AND REMOVE ROCKER ARM COVER
3. LOOSEN ALL INNER AND OUTER ADJUSTING SCREWS (6)
6. TURN INNER ADJUSTING SCREW UNTIL PRESSURE IS NOTED AT STOP LEVER
CONTROL TUBE
7. TURN OUTER ADJUSTING SCREW UNTIL IT BOTTOMS LIGHTLY ON CONTROL TUBE
8. ALTERNATELY TIGHTEN INNER AND OUTER SCREWS
INNER ADJUSTING SCREW
OUTER ADJUSTING SCREW
4. MOVE SPEED CONTROL LEVER TO FULL SPEED POSITION
5. MOVE STOP LEVER TO RUN POSITION AND HOLD IN THIS POSITION LIGHTLY
INJECTOR RACK CONTROL LEVER
SPEED CONTROL LEVER
STOP LEVER
10. CONNECT STOP LEVER LINKAGE AND INSTALL ROCKER ARM COVER
9. ADJUST BUFFER SCREW TO ATTAIN 500 TO 600 RPM IDLE SPEED AND TIGHTEN LOCKNUT
2. LOOSEN BUFFER SCREW LOCKNUT AND BACK BUFFER SCREW OUT 5/8 INCH
B. INJECTOR CONTROL LEVER ADJUSTMENT
MEC 3810-287-15 3-29(2)

Figure 3-29 (2).—Continued.

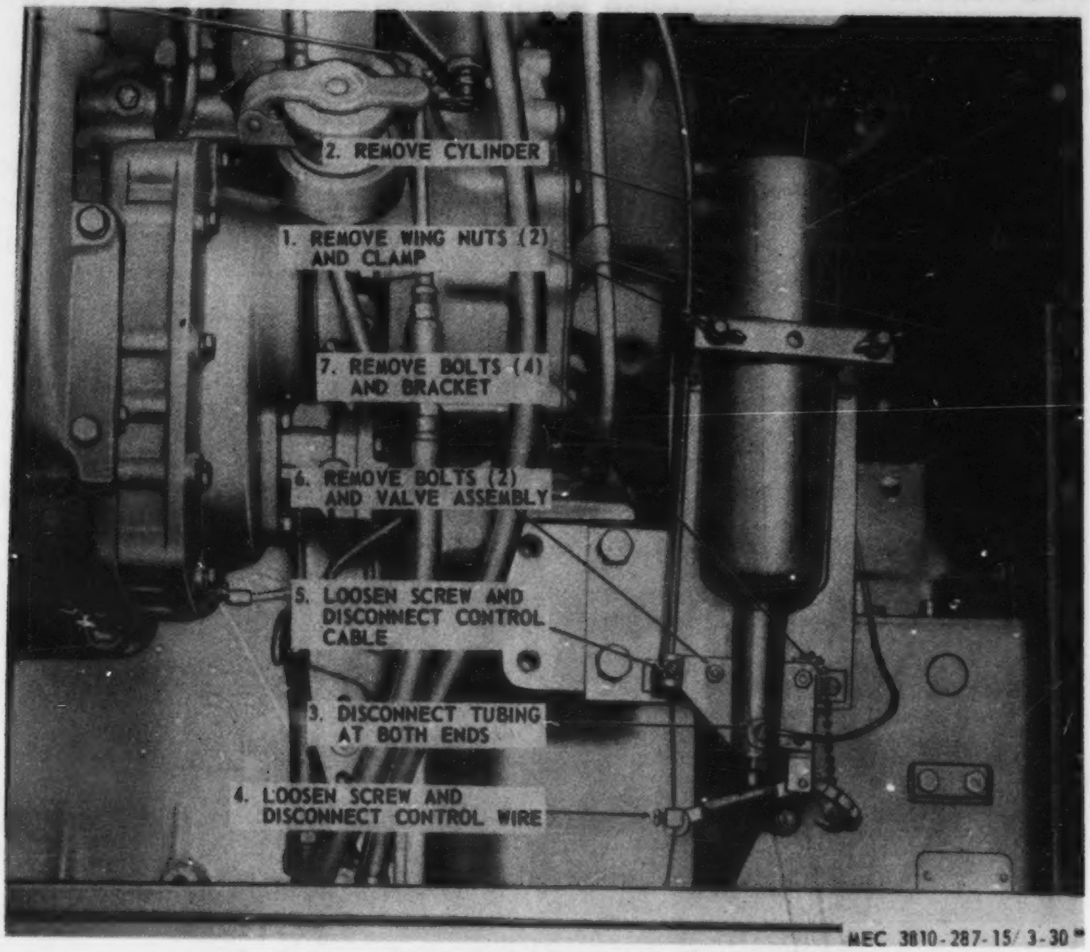

2. REMOVE CYLINDER
1. REMOVE WING NUTS (2) AND CLAMP
7. REMOVE BOLTS (4) AND BRACKET
6. REMOVE BOLTS (2) AND VALVE ASSEMBLY
5. LOOSEN SCREW AND DISCONNECT CONTROL CABLE
3. DISCONNECT TUBING AT BOTH ENDS
4. LOOSEN SCREW AND DISCONNECT CONTROL WIRE
MEC 3810-287-15/3-30

Figure 3-30. Cold weather starting aid assembly, removal and installation.

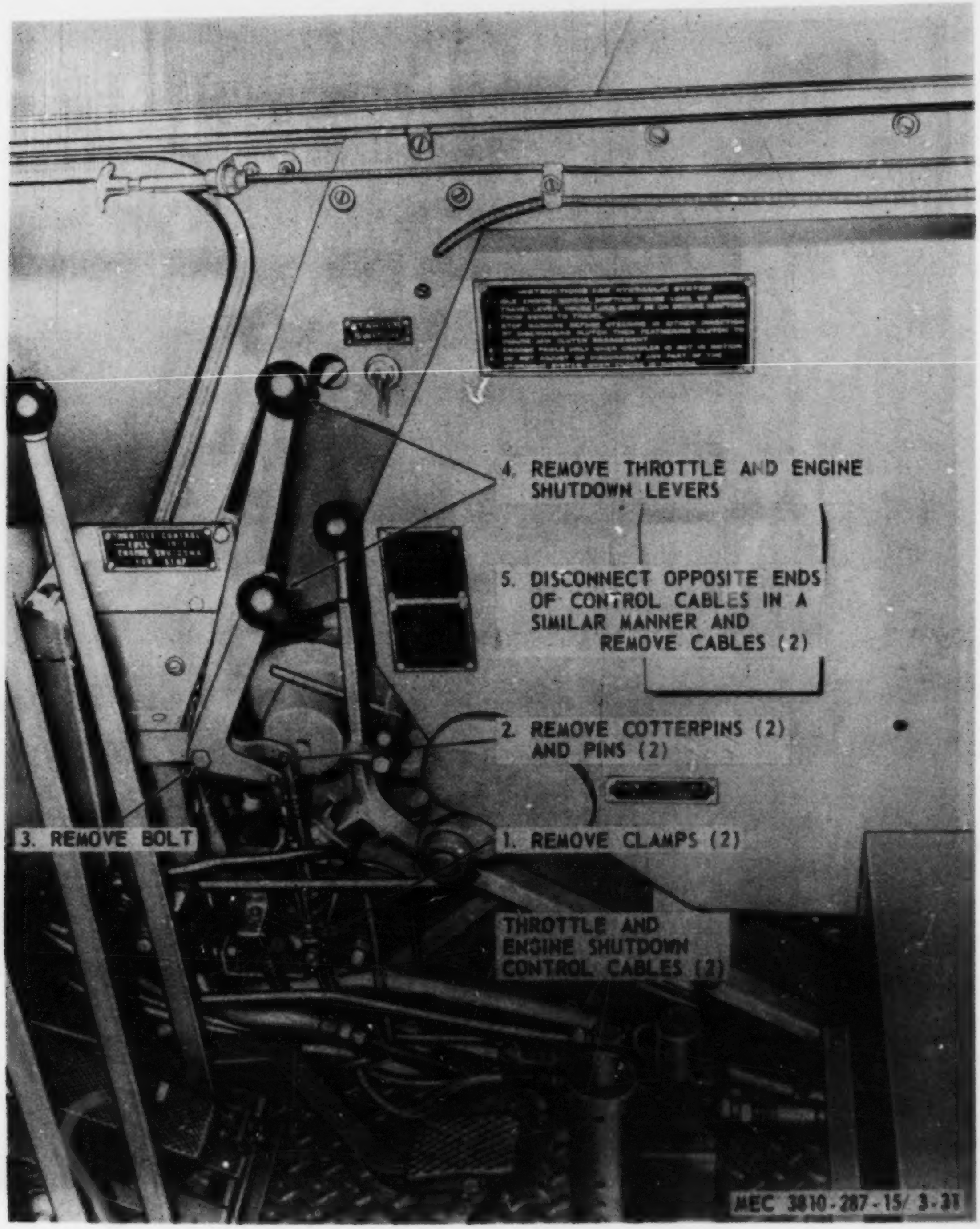

4. REMOVE THROTTLE AND ENGINE SHUTDOWN LEVERS
5. DISCONNECT OPPOSITE ENDS OF CONTROL CABLES IN A SIMILAR MANNER AND REMOVE CABLES (2)
2. REMOVE COTTERPINS (2) AND PINS (2)
3. REMOVE BOLT
1. REMOVE CLAMPS (2)
THROTTLE AND ENGINE SHUTDOWN CONTROL CABLES (2)
MEC 3810-287-15/3-31

Figure 3-31. Throttle controls, removal and installation.

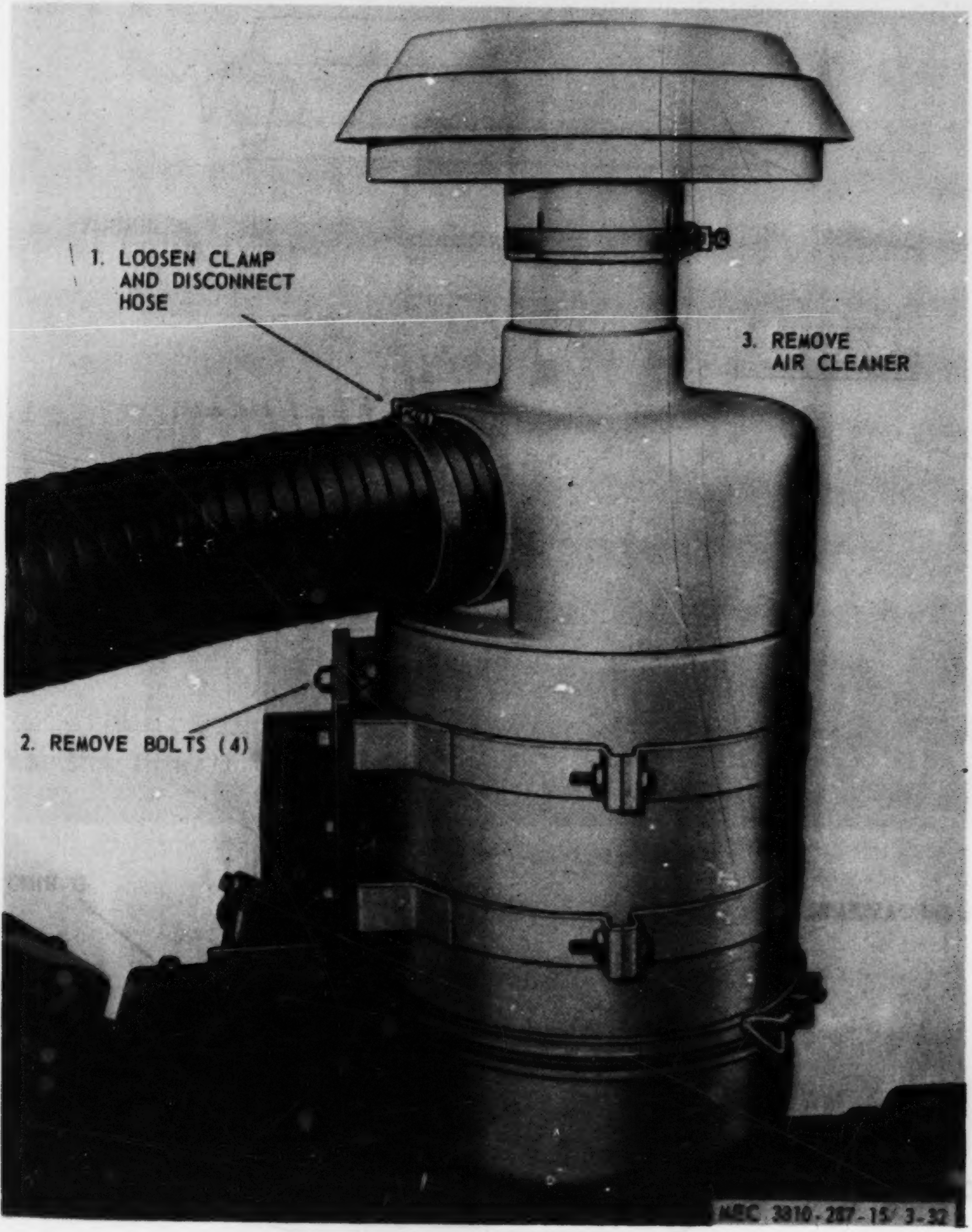

1. LOOSEN CLAMP AND DISCONNECT HOSE
3. REMOVE AIR CLEANER
2. REMOVE BOLTS (4)
MEC 3810-287-15/3-32

Figure 3-32. Air cleaner assembly, removal and installation.

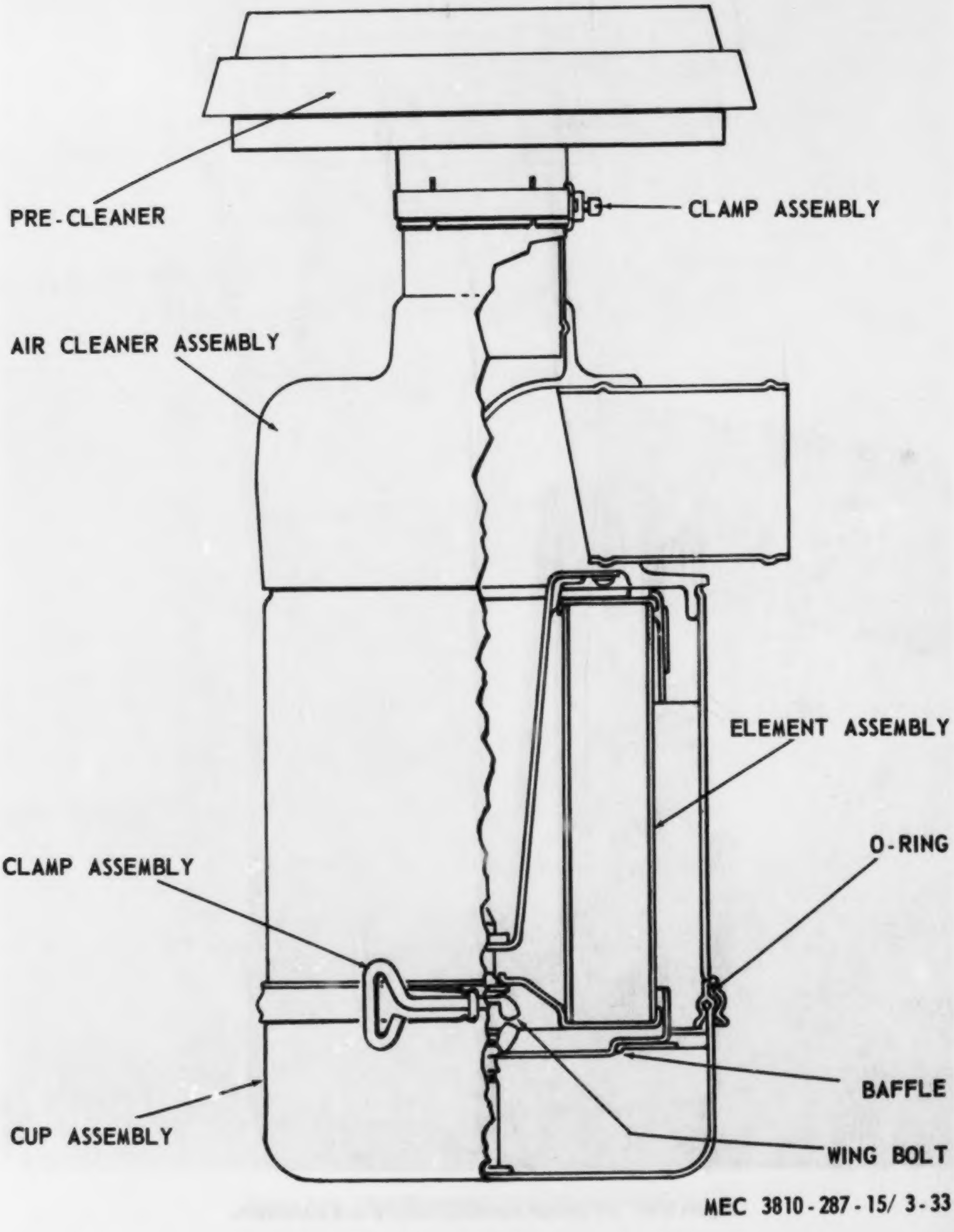

PRE-CLEANER
CLAMP ASSEMBLY
AIR CLEANER ASSEMBLY
ELEMENT ASSEMBLY
O-RING
CLAMP ASSEMBLY
BAFFLE
CUP ASSEMBLY
WING BOLT
MEC 3810-287-15/ 3-33

Figure 3-33. Air cleaner assembly, cross-sectional view.

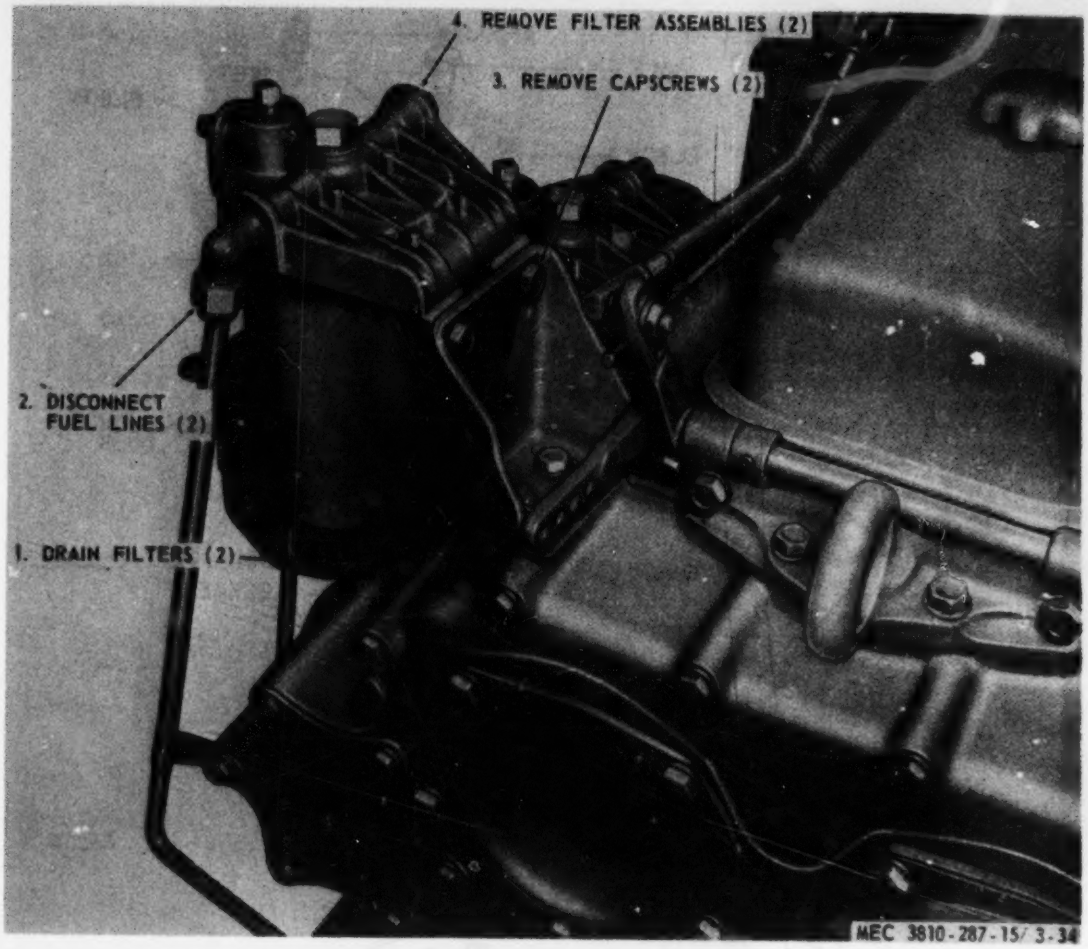

4. REMOVE FILTER ASSEMBLIES (2)
3. REMOVE CAPSCREWS (2)
2. DISCONNECT FUEL LINES (2)
1. DRAIN FILTERS (2)
MEC 3810-287-15/3-34

Figure 3-34. Fuel filters, removal and installation.

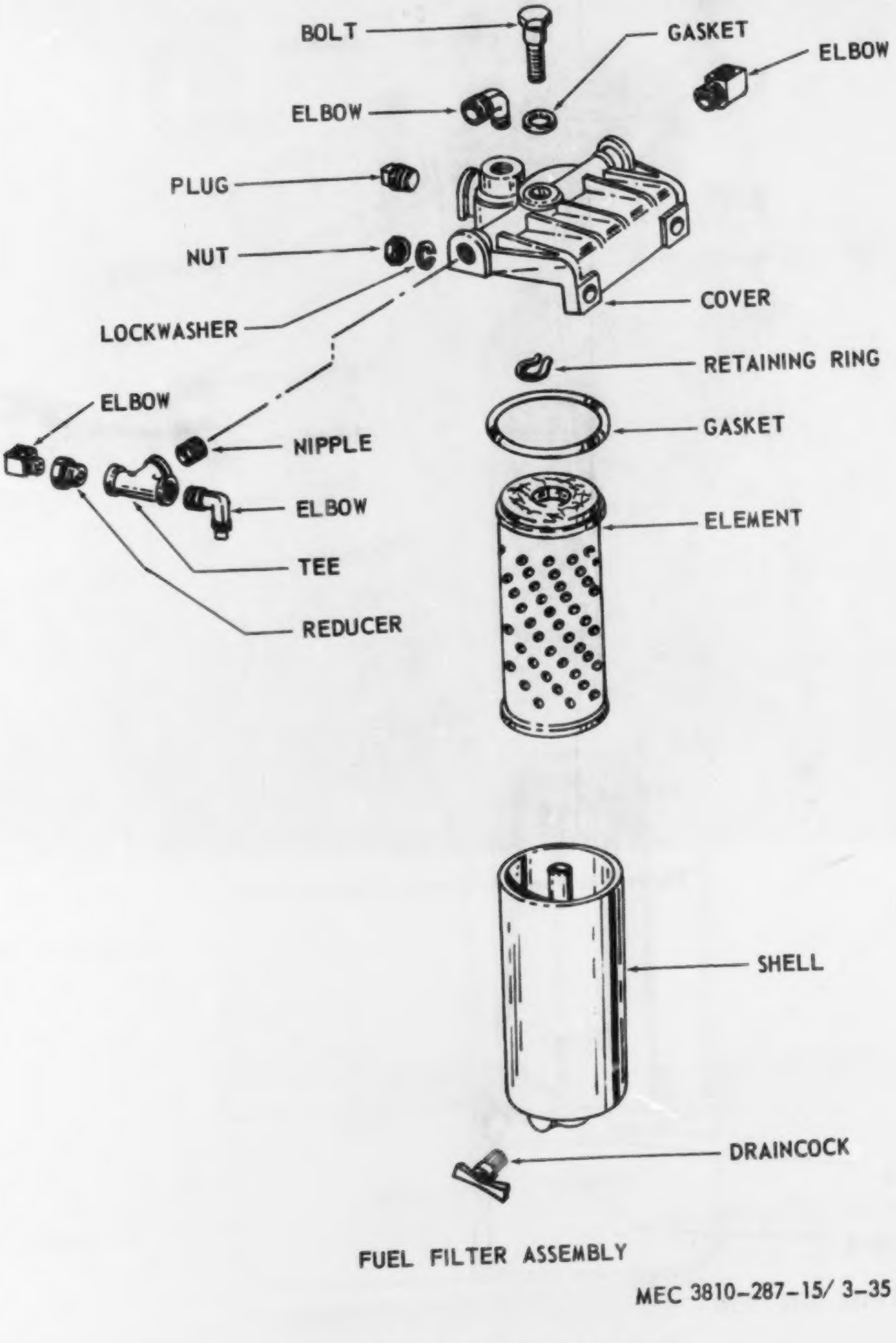
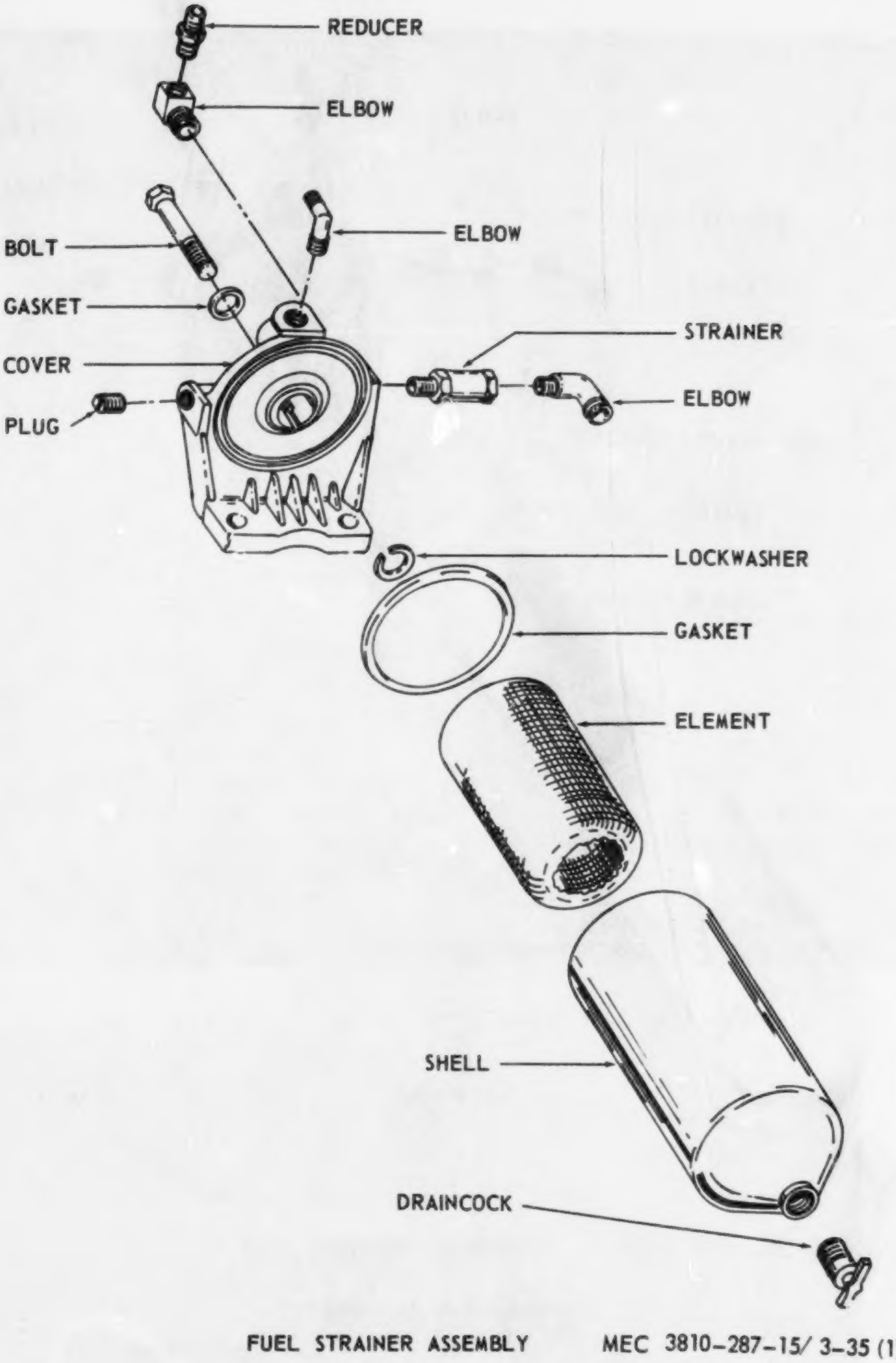

BOLT
GASKET
ELBOW
ELBOW
PLUG
NUT
COVER
LOCKWASHER
RETAINING RING
ELBOW
GASKET
NIPPLE
ELEMENT
ELBOW
TEE
REDUCER
SHELL
DRAINCOCK
FUEL FILTER ASSEMBLY
MEC 3810-287-15/ 3-35 (2)

Figure 3-35 (1). Fuel filters, exploded view.


REDUCER
ELBOW
ELBOW
BOLT
GASKET
COVER
PLUG
STRAINER
ELBOW
LOCKWASHER
GASKET
ELEMENT
SHELL
DRAINCOCK

FUEL STRAINER ASSEMBLY MEC 3810-287-15/ 3-35 (1)

Figure 3-35 (2).—Continued.

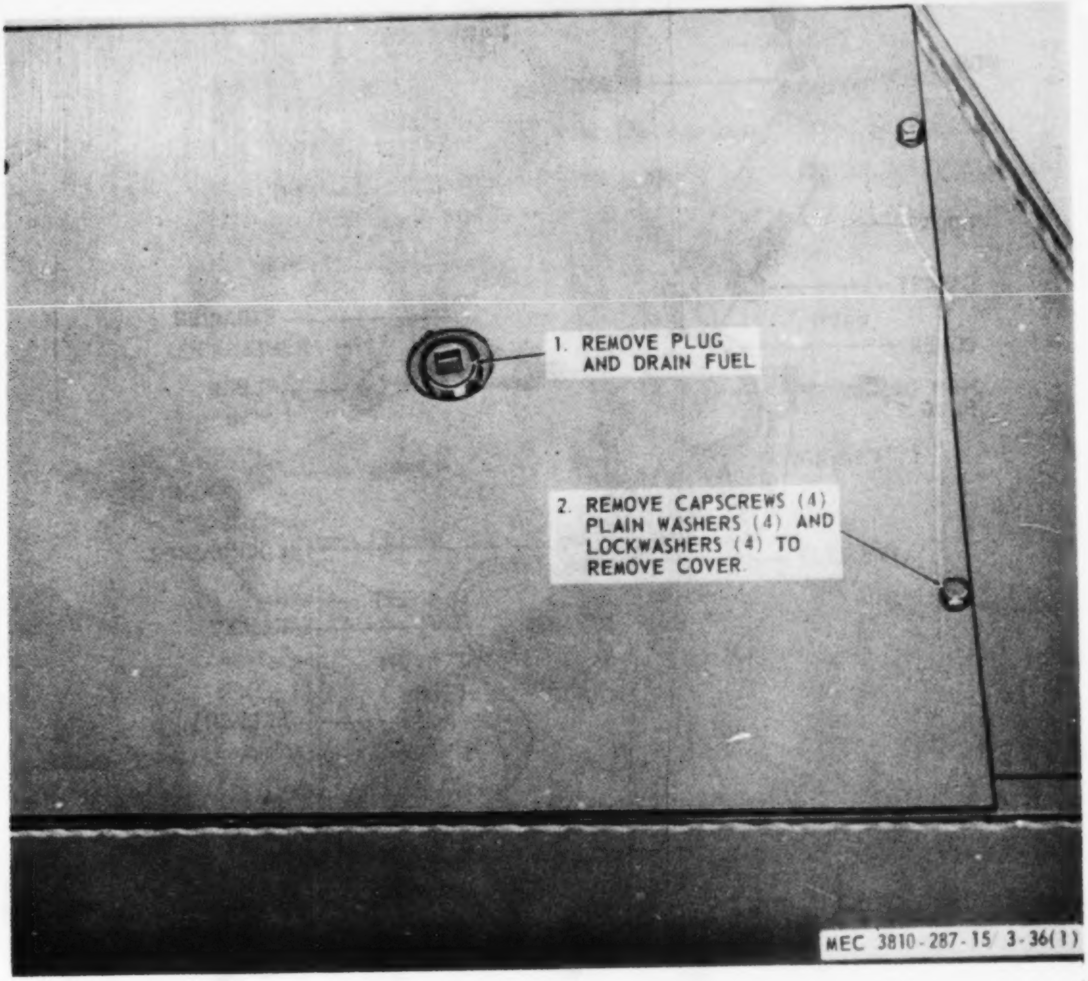

1. REMOVE PLUG AND DRAIN FUEL
2. REMOVE CAPSCREWS (4) PLAIN WASHERS (4) AND LOCKWASHERS (4) TO REMOVE COVER.
MEC 3810-287-15/3-36(1)

Figure 3-36 (1). Fuel tank, lines and fittings, removal and installation.

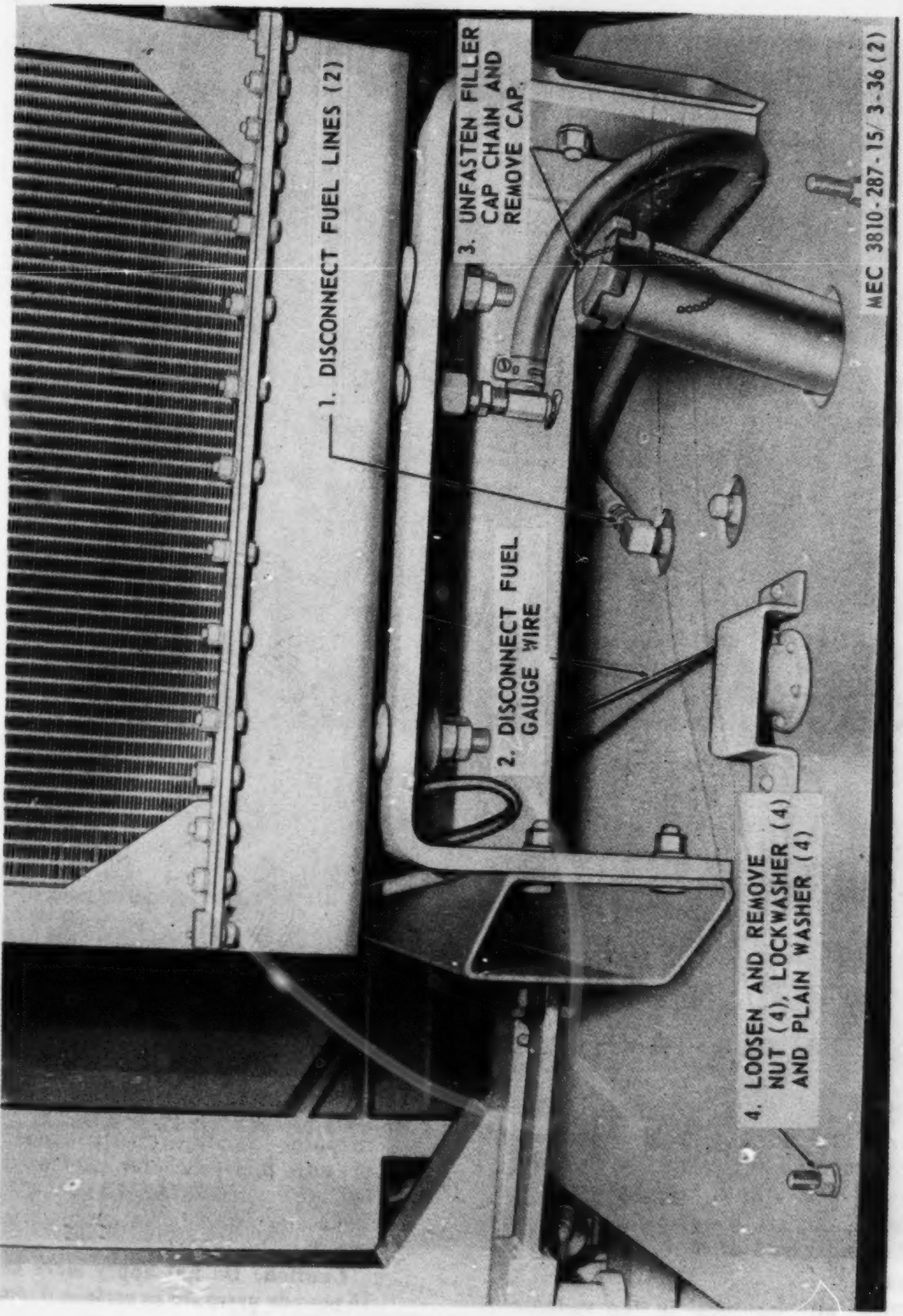

1. DISCONNECT FUEL LINES (2)
2. DISCONNECT FUEL GAUGE WIRE
3. UNFASTEN FILLER CAP CHAIN AND REMOVE CAP.
4. LOOSEN AND REMOVE NUT (4), LOCKWASHER (4) AND PLAIN WASHER (4)
MEC 3810-287-15/3-36(2)

Figure 3-36 (2).—Continued.

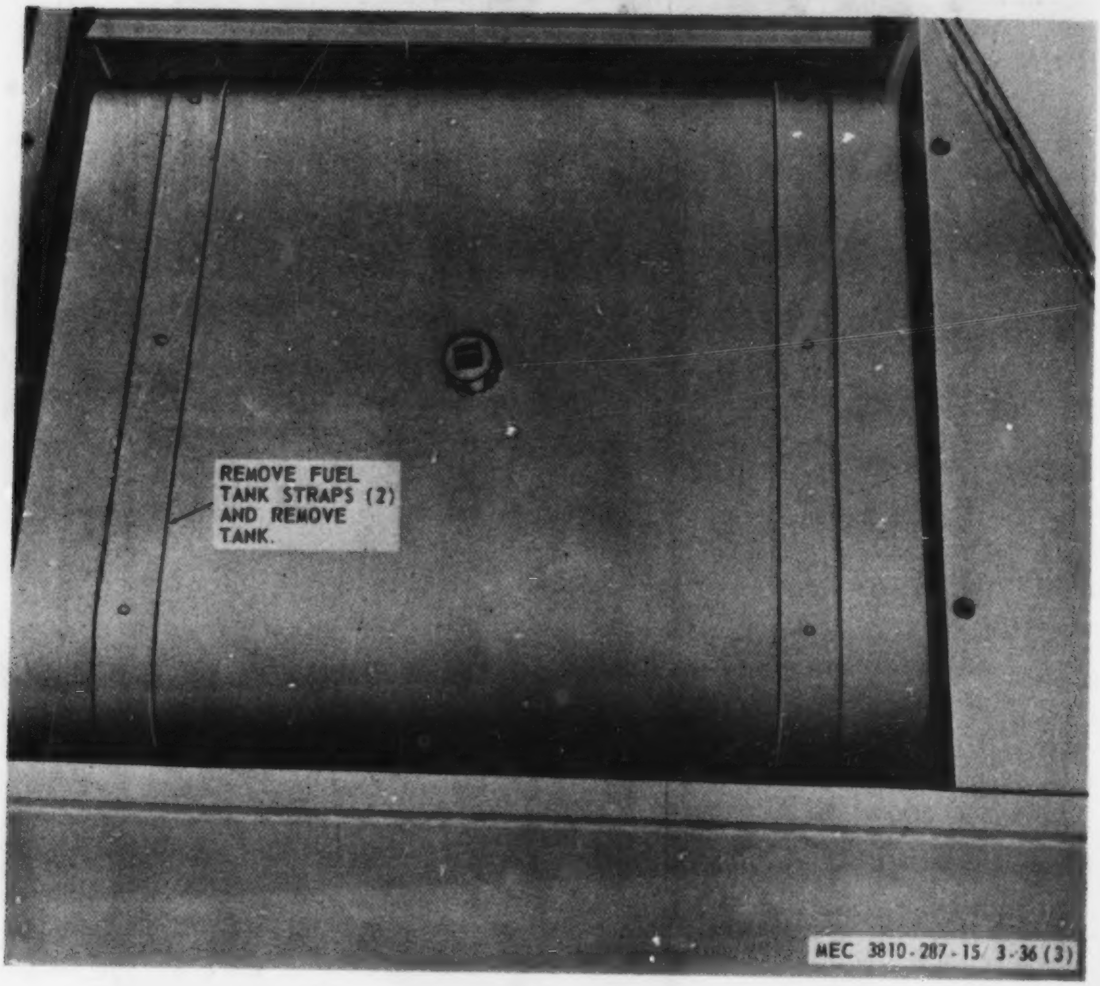

REMOVE FUEL TANK STRAPS (2) AND REMOVE TANK.
MEC 3810-287-15/ 3-36 (3)

Figure 3-36 (3)—Continued.

Section VIII. COOLING SYSTEM

3-56. Radiator

a. General. The radiator is located at the front of the engine and provides the reservoir and cooling core for the cooling system.

b. Removal. Remove the radiator assembly as instructed on figure 3-37.

c. Testing.

(1) Plug all openings in the radiator core except overflow pipe.

(2) Attach an air hose to the overflow pipe and submerge the entire core in water. Apply 10 to 15 pounds air pressure and watch for bubbles. The bubbles will indicate location of leaks and assist in determining size of hole.

***Caution:* Do not apply more than 15 pounds pressure as serious damage could result.**

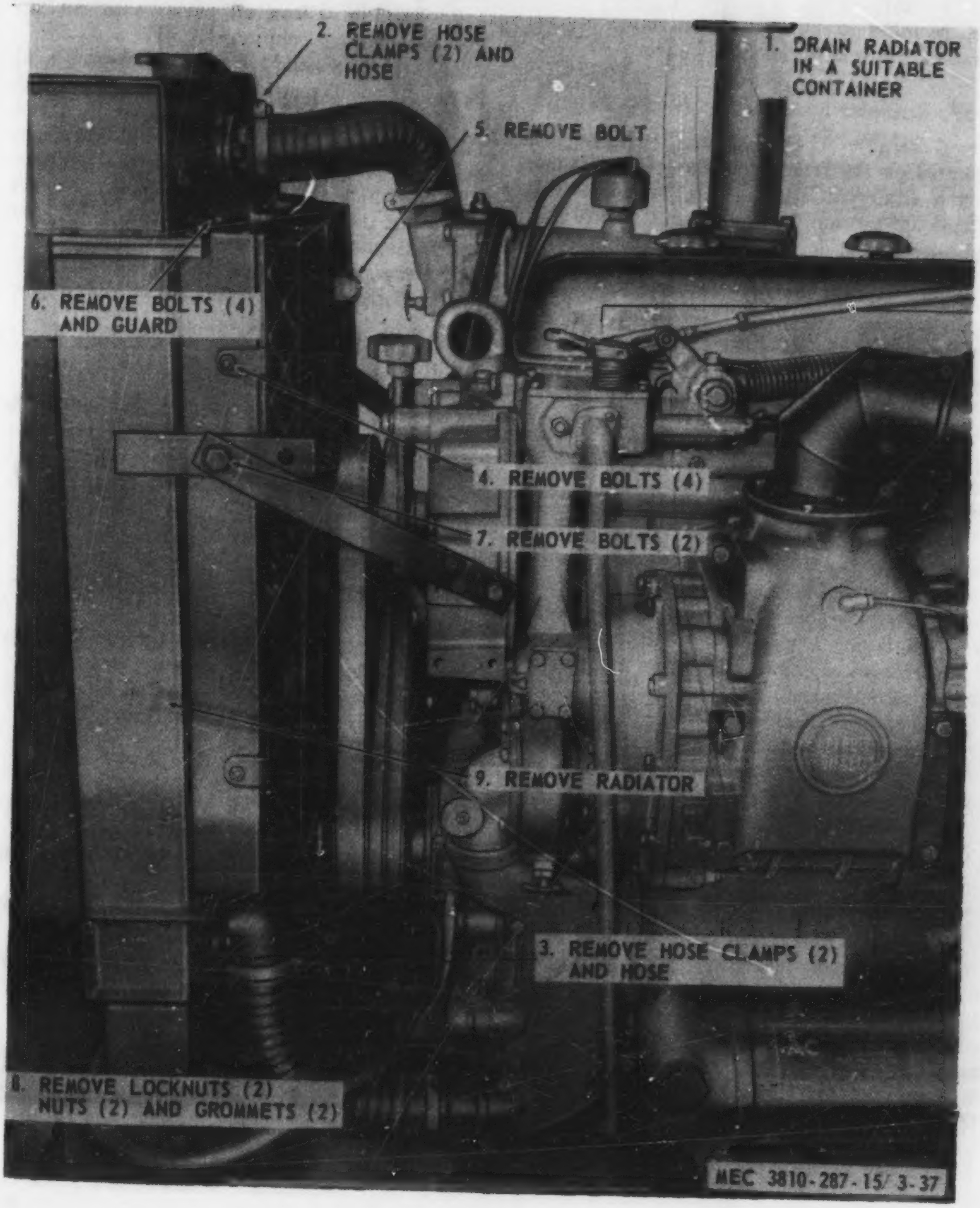

1. DRAIN RADIATOR IN A SUITABLE CONTAINER
2. REMOVE HOSE CLAMPS (2) AND HOSE
5. REMOVE BOLT
6. REMOVE BOLTS (4) AND GUARD
4. REMOVE BOLTS (4)
7. REMOVE BOLTS (2)
9. REMOVE RADIATOR
3. REMOVE HOSE CLAMPS (2) AND HOSE
8. REMOVE LOCKNUTS (2) NUTS (2) AND GROMMETS (2)
MEC 3810-287-15/3-37

Figure 3-37. Radiator assembly, removal and installation.

(3) Replace a leaking or defective radiator.

d. Installation. Install the radiator in reverse of the instructions on figure 3-37.

3-57. Radiator Shroud

a. General. The radiator shroud is mounted on the front of radiator and extends to the outer cab panel. The shroud directs outside air through the radiator to assure adequate cooling.

b. Removal. Remove the radiator shroud as instructed on figure 3-38.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for damage. Replace damaged parts.

e. Installation. Install the radiator shroud in reverse of the instructions on figure 3-38.

3-58. Water Manifold

a. General. The water manifold is mounted on top of the engine cylinder head and contains the thermostat housing and vent valves. Its purpose is to route the coolant from the engine back to the radiator assembly.

b. Removal. Remove the water manifold as instructed on figure 3-39.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for damage. Replace damaged parts.

e. Installation. Install the water manifold in reverse of the instructions on figure 3-39.

3-59. Thermostat and Housing

a. General. The thermostat and thermostat housing are mounted on the front end of the water manifold. The thermostat is temperature sensitive and restricts the circulation of coolant through the system until operating temperature is reached. It then opens and allows only enough circulation through the system to maintain a proper operating temperature for the engine.

b. Removal. Remove the thermostat and housing as instructed on figure 3-40.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect al parts for damage. Replace damaged parts.

e. Testing. Place the thermostat in a container of water along with a suitable thermometer. Heat the water and note the temperature at which the thermostat opens. Normal operating temperature is between 160° and 185°. Replace a defective thermostat.

f. Installation. Install the thermostat and housing in reverse of the instructions on figure 3-40.

3-60. Fan Blade

a. General. The fan blade is located in the front of the engine and rear of the radiator. The fan draws air through the radiator for cooling. The fan is belt-driven from the engine crankshaft.

b. Removal. Remove the fan blade as instructed on figure 3-41.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for damage. Replace damaged parts.

e. Installation. Install the fan blade in reverse of the instructions on figure 3-41.

3-61. Fan V-belt

a. General. The fan V-belt drives the fan assembly from the crankshaft front pulley.

b. Removal. Remove the fan V-belt as instructed on figure 3-42.

c. Cleaning. Clean the fan V-belt with an approved cleaning solution.

d. Inspection and Repair. Inspect the belt for wear, defects, and damage. Replace a worn, defective, or damaged belt.

e. Installation. Install the fan V-belt in reverse of the instructions on figure 3-42.

f. Adjustment. Refer to paragraph 3-10 and adjust the fan V-belt.

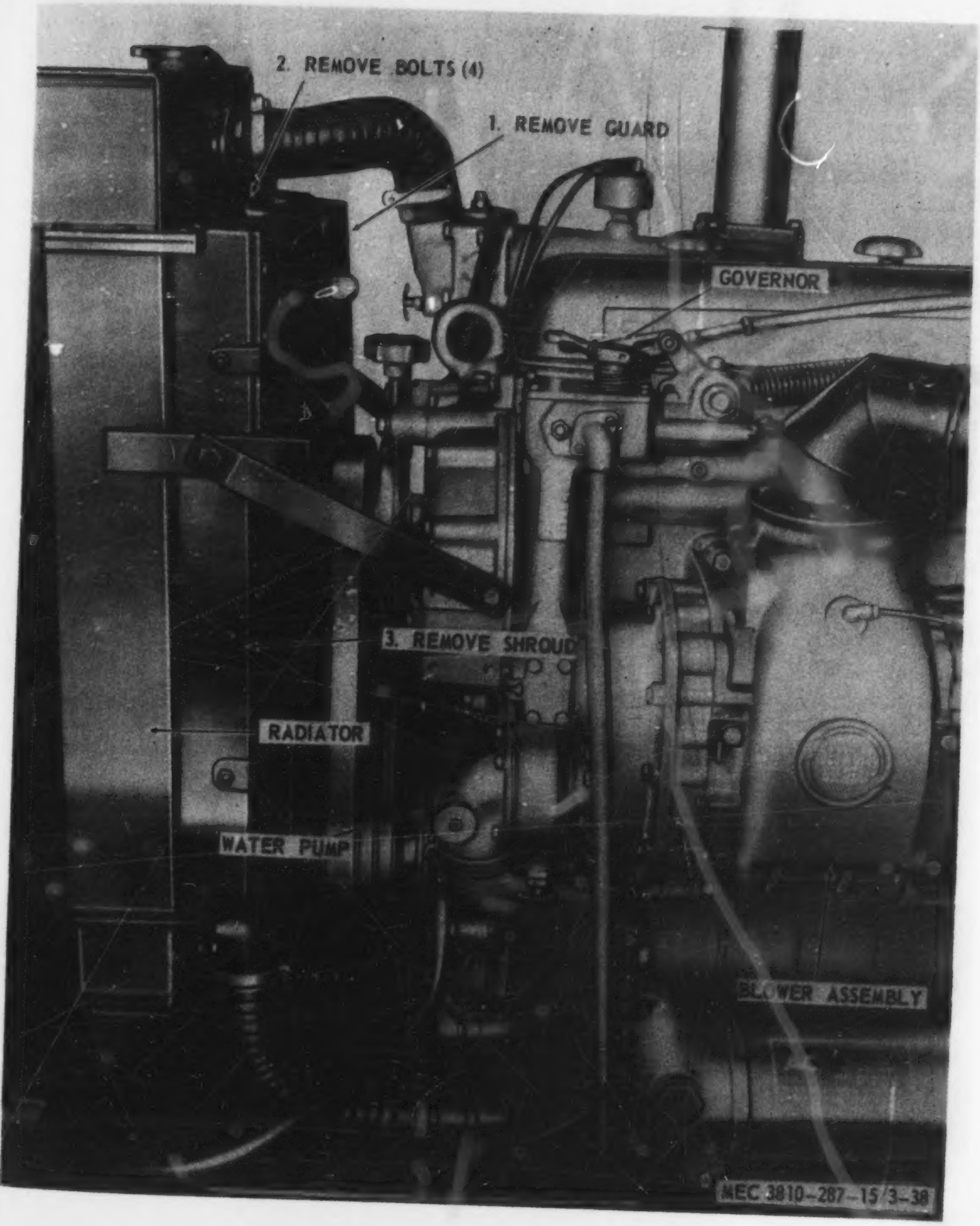

2. REMOVE BOLTS (4)
1. REMOVE GUARD
GOVERNOR
3. REMOVE SHROUD
RADIATOR
WATER PUMP
BLOWER ASSEMBLY
MEC 3810-287-15/3-38

Figure 3-38. Radiator shroud, removal and installation.

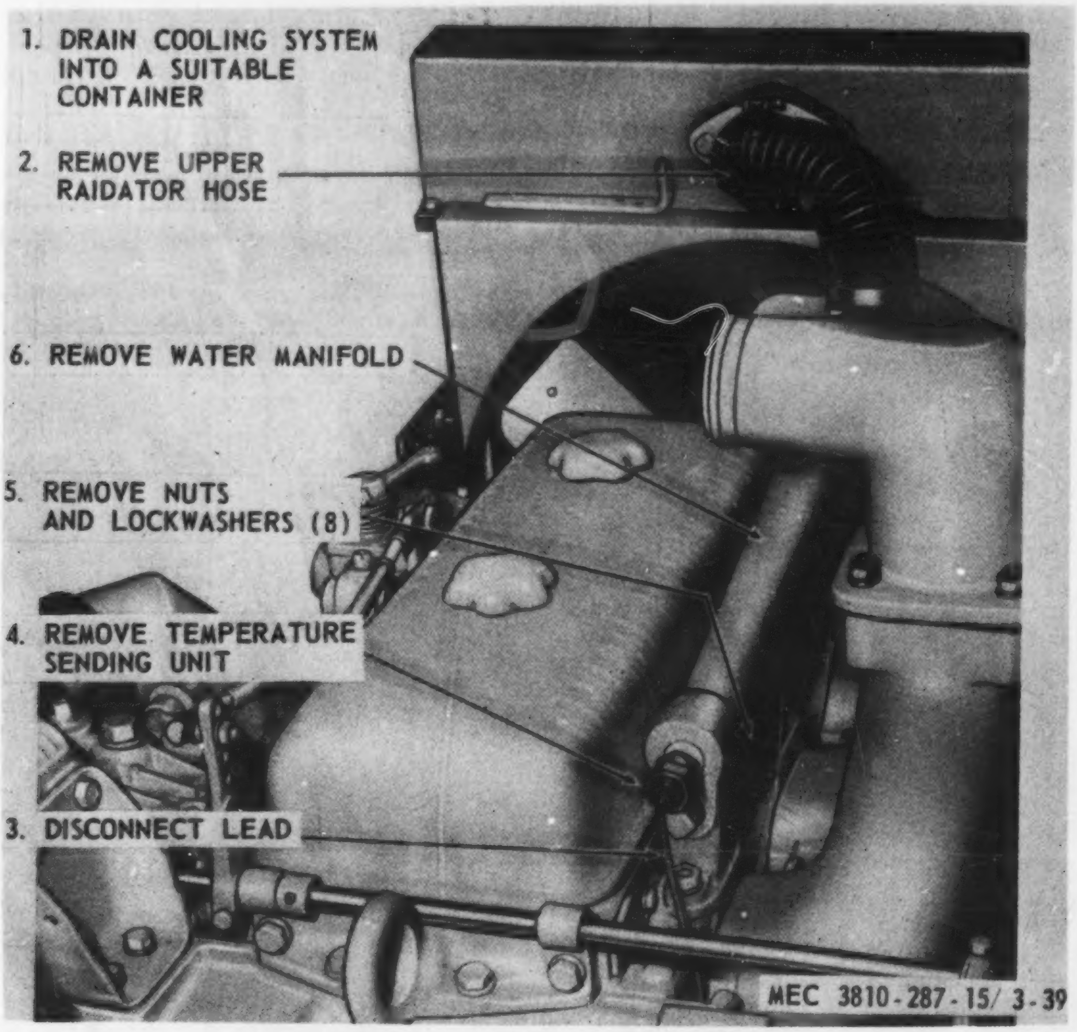

1. DRAIN COOLING SYSTEM INTO A SUITABLE CONTAINER
2. REMOVE UPPER RAIDATOR HOSE
6. REMOVE WATER MANIFOLD
5. REMOVE NUTS AND LOCKWASHERS (8)
4. REMOVE TEMPERATURE SENDING UNIT
3. DISCONNECT LEAD
MEC 3810-287-15/ 3-39

Figure 3-39. Water manifold, removal and installation.

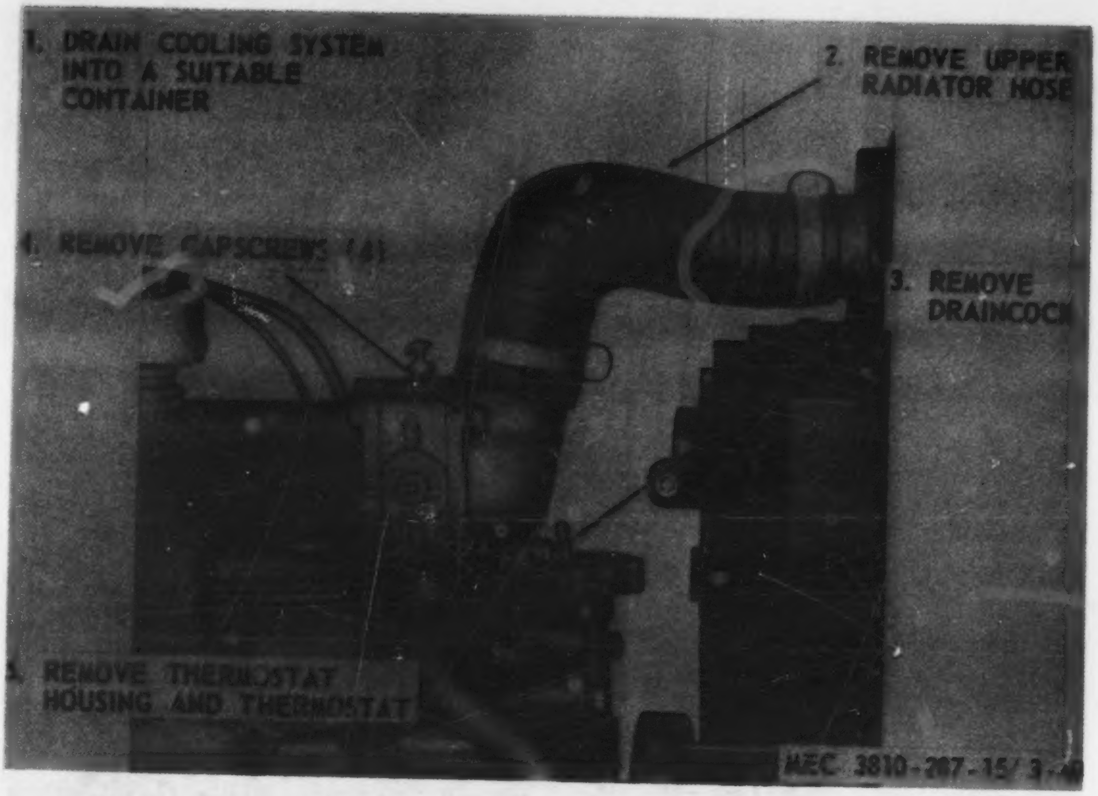

1. DRAIN COOLING SYSTEM
INTO A SUITABLE
CONTAINER
2. REMOVE UPPER
RADIATOR HOSE
4. REMOVE CAPSCREWS (4)
3. REMOVE
DRAINCOCK
5. REMOVE THERMOSTAT
HOUSING AND THERMOSTAT
MEC 3810-287-15/3-40

Figure 3-40. Thermostat and housing, removal and installation.

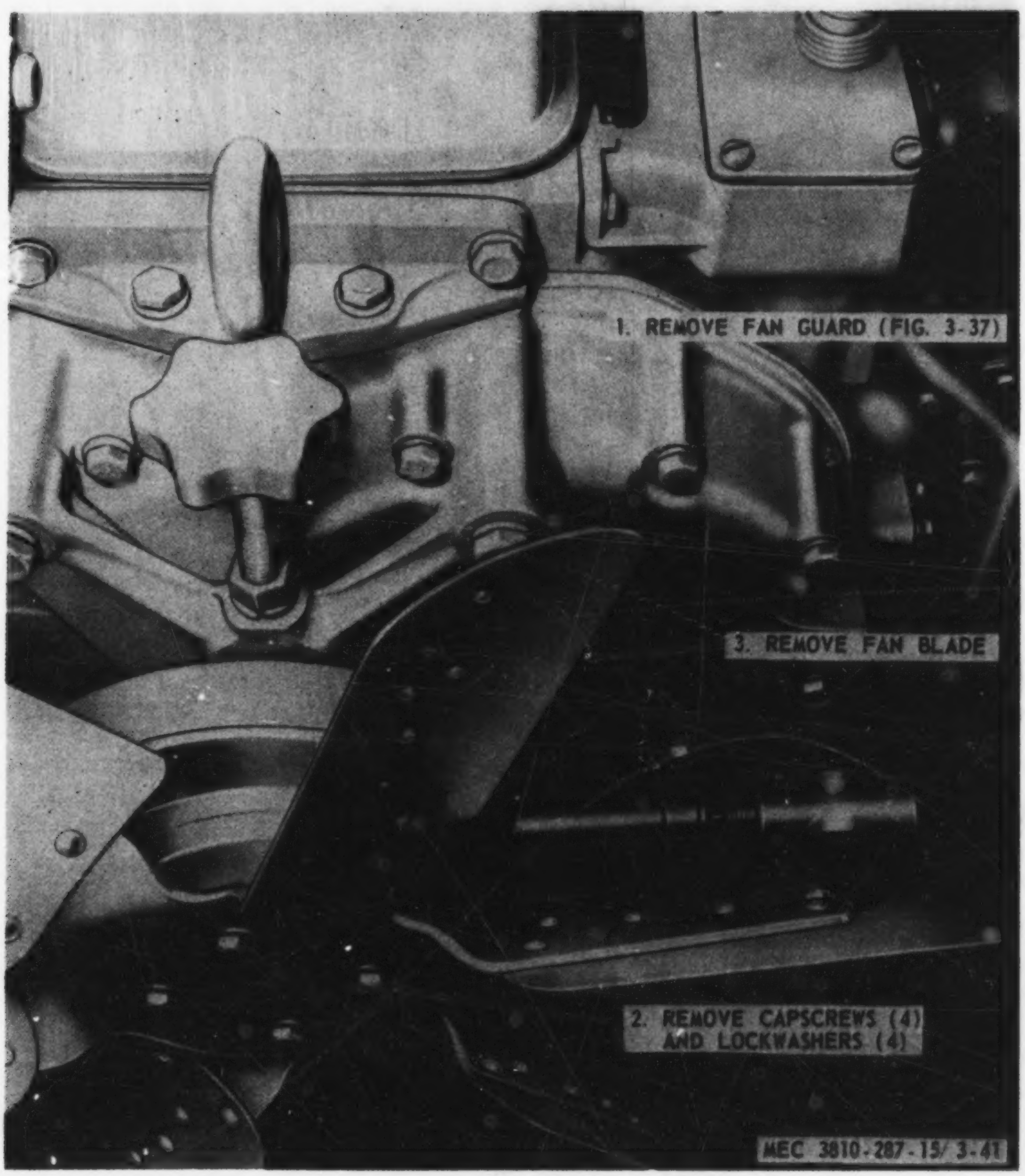

1. REMOVE FAN GUARD (FIG. 3-37)
3. REMOVE FAN BLADE
2. REMOVE CAPSCREWS (4) AND LOCKWASHERS (4)
MEC 3810-287-15/ 3-41

Figure 3-41. Fan blade, removal and installation.

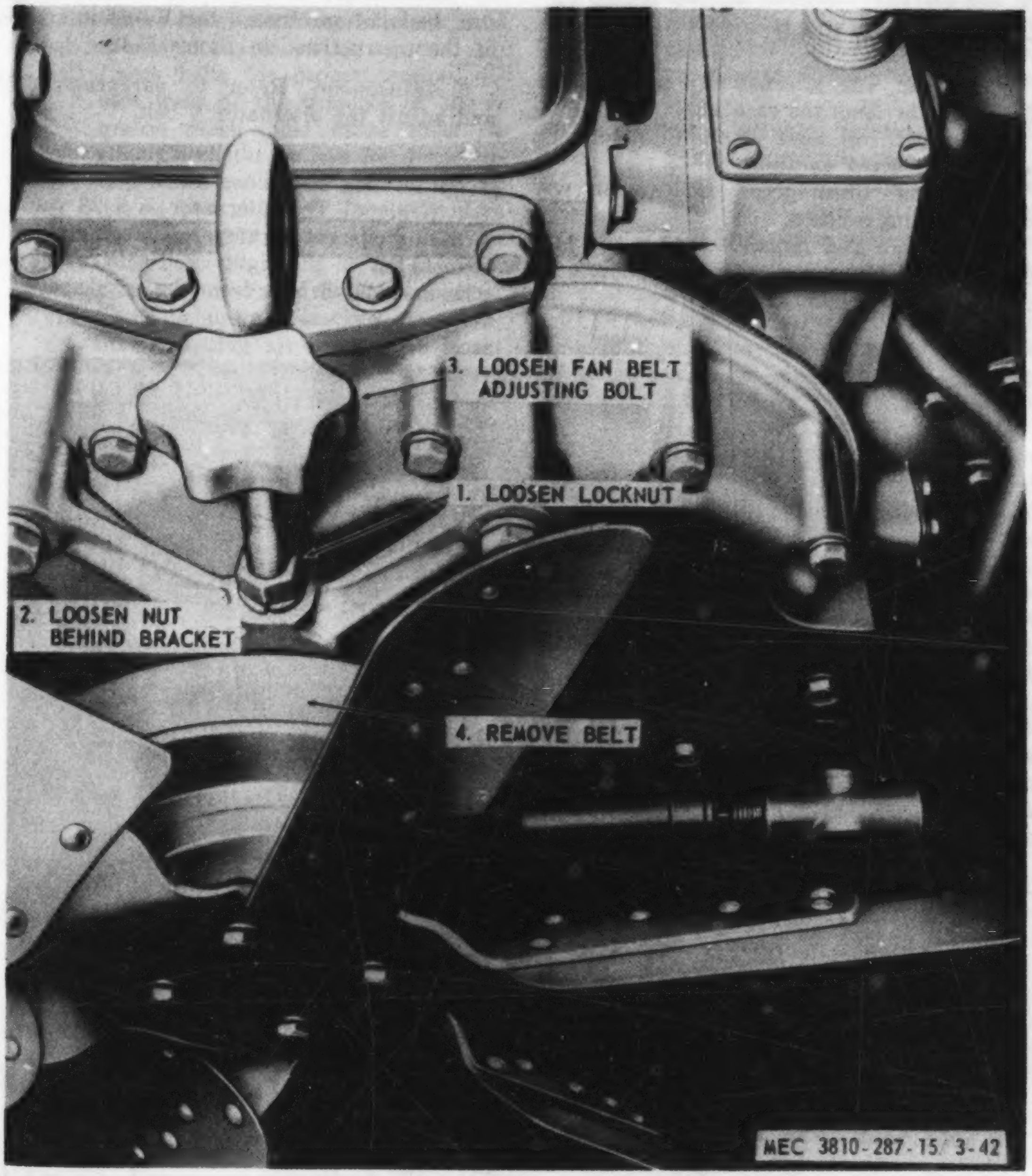

3. LOOSEN FAN BELT ADJUSTING BOLT
1. LOOSEN LOCKNUT
2. LOOSEN NUT BEHIND BRACKET
4. REMOVE BELT
MEC 3810-287-15/3-42

Figure 3-42. Fan V-belt, removal and installation.

Section IX. ELECTRICAL SYSTEM

3-62. Alternator V-belt

a. General. The alternator V-belt drives the alternator from the crankshaft pulley.

b. Removal. Remove the alternator V-belt as instructed on figure 3-43.

c. Cleaning. Clean the belt with an approved cleaning solution.

d. Inspection and Repair. Inspect the belt for wear, defects and damage. Replace a worn, defective or damaged belt.

e. Installation. Install the V-belt in reverse of the instructions on figure 3-43.

f. Adjustment. Refer to paragraph 3-11 and adjust the alternator V-belt.

3-63. Alternator

a. General. The alternator is a 28 volt alternating current 60 ampere charging unit. It is mounted on the right hand side of the engine and belt driven from the crankshaft.

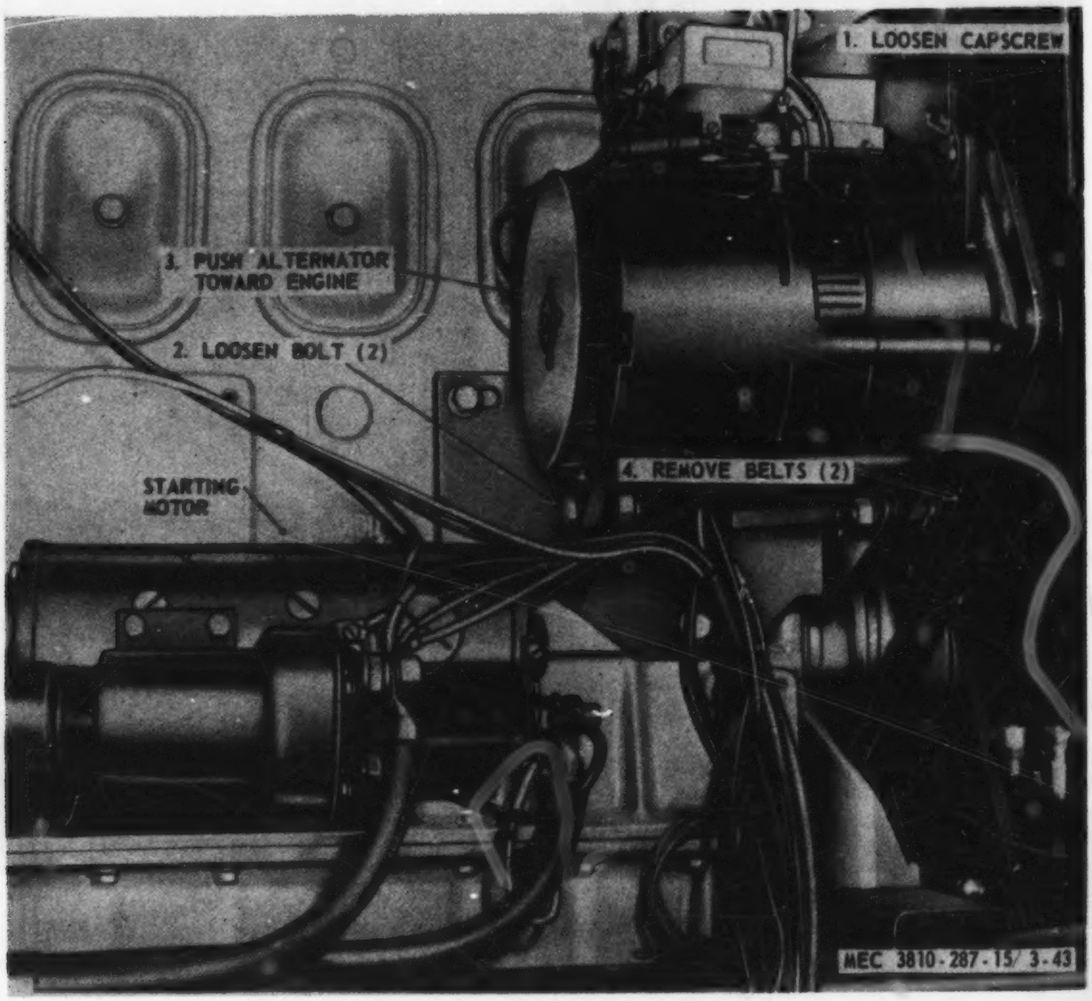

1. LOOSEN CAPSCREW
3. PUSH ALTERNATOR TOWARD ENGINE
2. LOOSEN BOLT (2)
STARTING MOTOR
4. REMOVE BELTS (2)
MEC 3810-287-15/3-43

Figure 3-43. Alternator V-belt, removal and installation.

b. On Vehicle Testing. Before removing the alternator for repair or replacement, inspect the drive belts, mounting brackets, and wiring harness in the following manner:

(1) Check belts for proper tension, excess wear or the presence of oil or grease which could cause them to slip. Check the pulleys for discoloration which could indicate overheating due to belt slippage. Inspect pulleys for wear which could allow belts to bottom in the pulley grooves. Replace any worn or defective parts.

(2) Check mounting brackets and tension adjusting arm. Wear or looseness of these parts will prevent proper belt adjustment and may result in misalignment which will cause premature wear on belts, pulleys, and bearings. Tighten or replace parts as necessary.

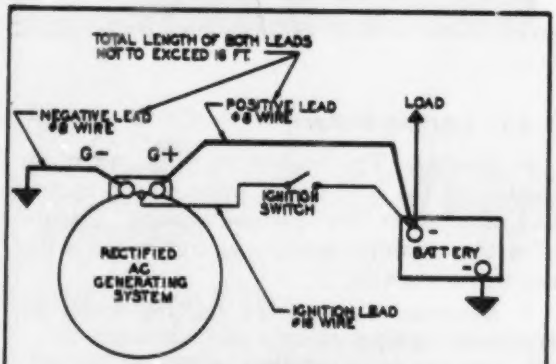
(3) Inspect all wiring and terminals for signs of wear, looseness or corrosion. Check for worn or frayed insulation which could result in shorts or grounds. Clean and tighten all terminals and connections.

(4) Check batteries. Take a specific gravity reading on each cell. Replace batteries which indicate one or more defective cells.

(5) After the above checks and adjustments have been performed, an electrical check may be made. An accurate voltmeter will be required.

(*a*) Remove the alternator terminal cover to expose the "G+" and "G–" terminals and check the voltage across these terminals. If the vehicle is equipped with a master switch, turn this on. Full battery voltage should be present. If no voltage is present across the G plus and G minus terminals, an open circuit between the alternator and battery is indicated. This may be due to loose or broken wiring or possibly a defective circuit breaker, master switch, or ammeter. Turn on the ignition switch and check for battery voltage between ground and the alternator ignition terminal. Correct any defects before proceeding to the next test. Full battery voltage must be present at the alternator positive terminal as well as the alternator ignition terminal when the ignition switch is turned on.

(*b*) Reconnect the voltmeter across the "G+" and "G–" alternator terminals. The engine should now be started and run at a speed which will maintain approximately 2,000 alternator RPM Electrical accessories should now be turned on until the alternator output is approximately 10 amps. At this point, the voltage should be 28.0. If the voltage is above or below this reading, it should be readjusted by removing the pipe plug from the top of the D.E. housing and turning the voltage adjusting screw with a small screwdriver. Increase voltage by turning the screw counterclockwise and decrease voltage by turning screw clockwise. Be sure to replace the plug after adjustments have been made to keep out the dirt and moisture. When vehicles are operated in locations where extremely high temperatures are encountered, it may



MEC 3810-287-15/ 3-44

Figure 3-44. Alternator assembly, on vehicle testing.

be necessary to reduce the voltage to prevent battery damage. Under these conditions voltage should be reduced to a point where batteries remain charged but do not overheat or use excessive amounts of water.

c. Removal.

(1) Remove the alternator drive belt (para 3-62).

(2) Remove the alternator assembly as instructed on figure 3-45.

d. Installation. Install the alternator assembly in reverse of the instructions on figure 3-45.

3-64. Altenator Drive Pulley

a. General. The alternator drive pulley is attached to the alternator armature shaft. It, and the alternator V-belt provide the drive from the crankshaft pulley.

b. Removal.

(1) Remove the alternator V-belt (para 3-60).

(2) Remove the alternator (para 3-61).

(3) Remove the alternator drive pulley as instructed on figure 3-46.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects, and damage. Replace worn, defective, or damaged parts.

e. Installation. Install the alternator drive pulley in reverse of the instructions on figure 3-46.

3-65. Starting Motor

a. General. The engine starting motor is located on the lower right rear of the engine and attached to the flywheel housing. It supplies the cranking power required to turn the engine for starting.

b. Removal. Remove the starting motor as instructed on figure 3-47.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Bench Testing.

(1) Inspect the starting motor assembly for visual damage. Replace a damaged starting motor assembly.

(2) Position the starting motor assembly on a test bench and attach leads for a motor free speed test as illustrated on figure 3-46.

(3) Normal free speed is 7,000 RPM minimum to 10,700 maximum. If the starting motor does not fall within these limitations, it must be replaced.

e. Installation. Install the starting motor in reverse of the instructions on figure 3-47.

3-66. Starting Motor Switch

a. General. The starting motor switch is mounted on the starting motor assembly. The switch is a solenoid type and engages the starter pinion gear with the flywheel ring gear when the starter button is engaged.

b. Removal.

(1) Remove the starting motor (para 3-63).

(2) Remove the starting motor switch as instructed on figure 3-49.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect the starting motor switch for visual damage and wear. Replace a damaged or worn switch.

e. Installation.

(1) Install the starting motor switch in reverse of the instructions on figure 3-49.

(2) Install the starting motor (para 3-63).

3-67. Batteries, Battery Box and Cables

a. General. The batteries and battery box are located in the right rear of the turntable bed. The batteries supply power for the crane-shovel electrical systems. They are two 12 volt batteries for a combined output of 24 volts.

b. Removal. Remove the batteries, battery box and cables as instructed on figure 3-50.

c. Cleaning. Clean all parts with an approved cleaning solution.

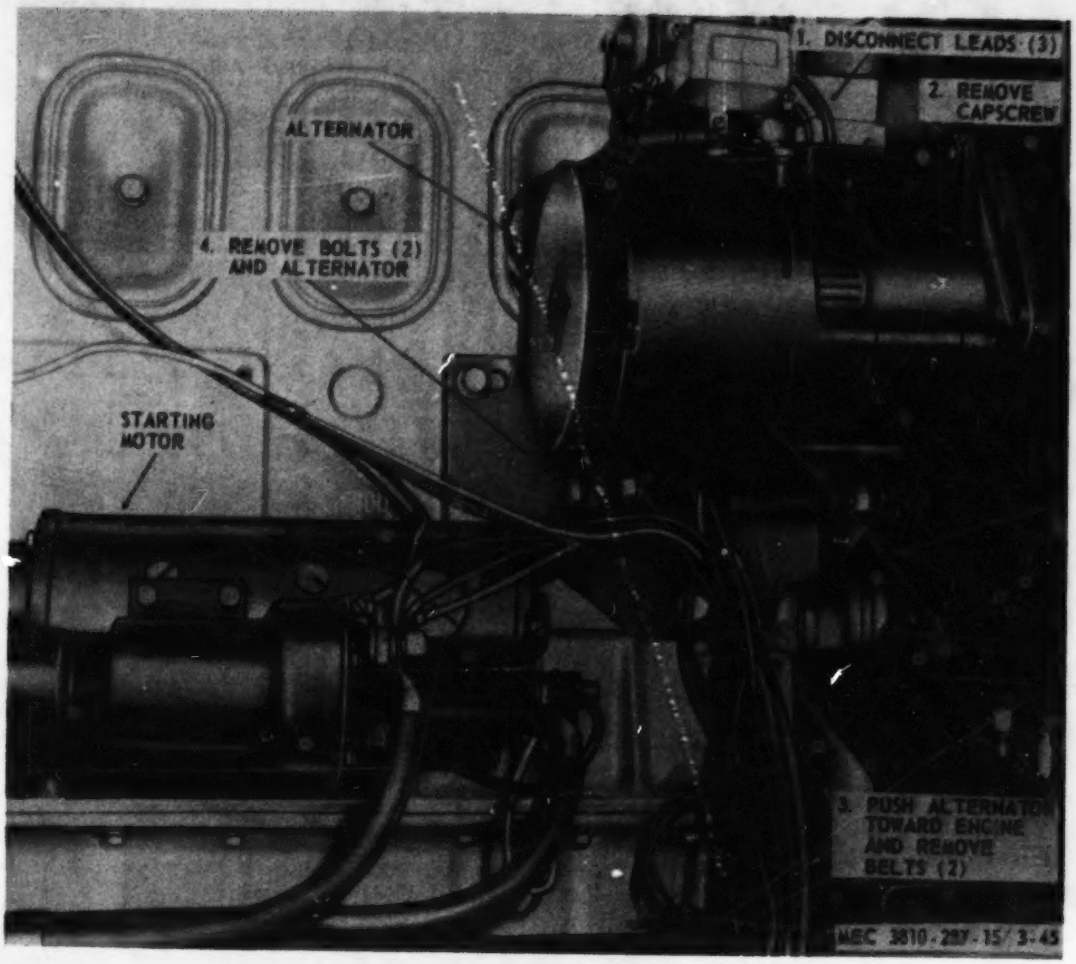

1. DISCONNECT LEADS (3)
2. REMOVE CAPSCREW
ALTERNATOR
4. REMOVE BOLTS (2) AND ALTERNATOR
STARTING MOTOR
3. PUSH ALTERNATOR TOWARD ENGINE AND REMOVE BELTS (2)
MEC 3810-287-15/3-45

Figure 3-45. Alternator assembly, removal and installation.

d. Inspection and Repair.

(1) Test the batteries with a hydrometer and recharge if below 1250. Inspect the battery case and terminals for damage. Replace a damaged battery. Test each cell with a voltmeter. Replace the battery if any cells are dead.

(2) Inspect the battery box for damage and corrosion. Replace a damaged or badly corroded battery box. Inspect and replace damaged battery cables.

e. Installation. Install the battery box, batteries, and cables in reverse of the instructions on figure 3-50.

3-68. Chassis Wiring

a. General. The chassis wiring includes all wiring to lights, switches, and controls. The wiring diagram (fig. 1-7) designates each wire by number.

b. Removal. Removal of wiring from the chassis is confined to only that wiring which

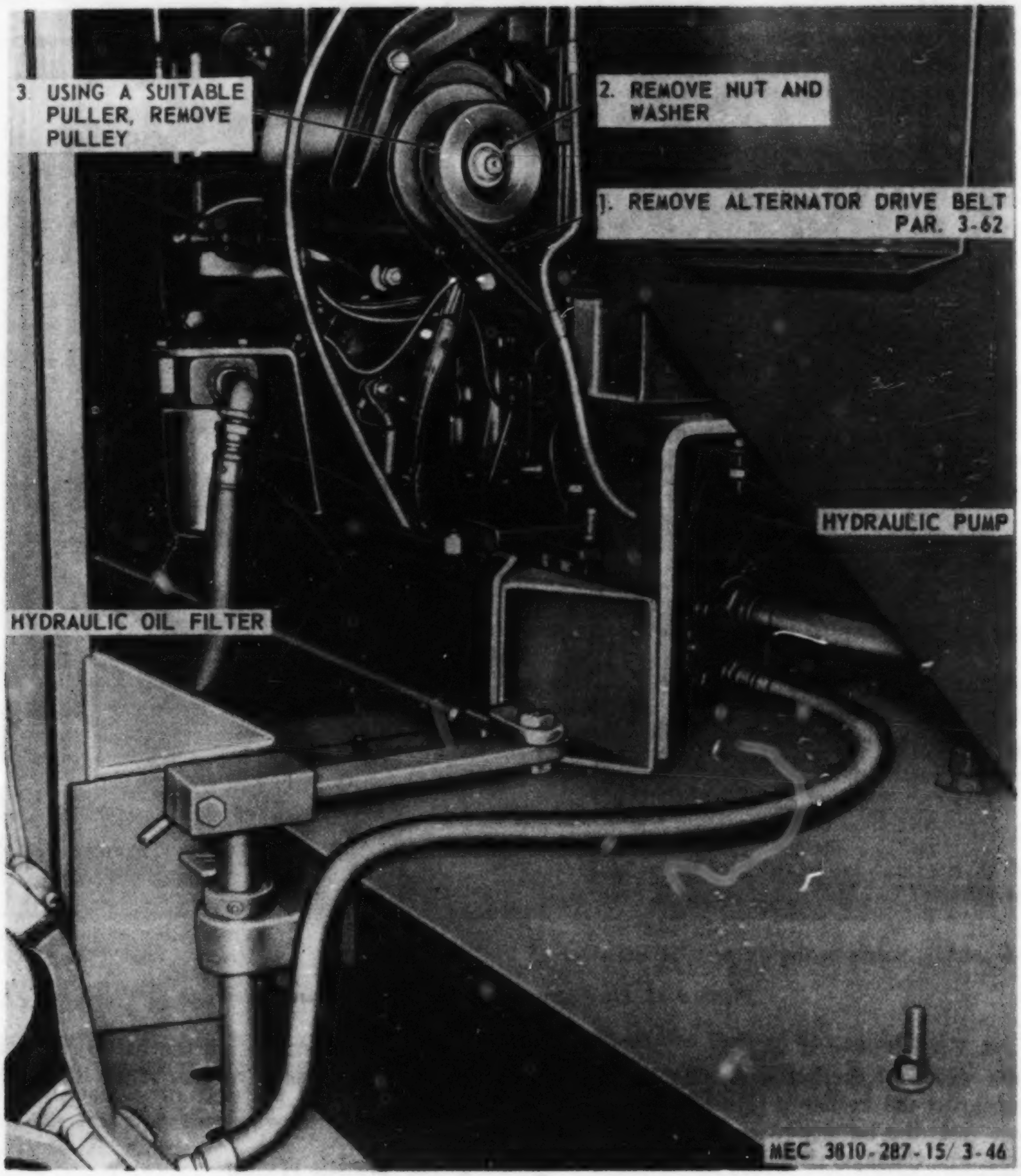

3. USING A SUITABLE PULLER, REMOVE PULLEY
2. REMOVE NUT AND WASHER
1. REMOVE ALTERNATOR DRIVE BELT PAR. 3-62
HYDRAULIC PUMP
HYDRAULIC OIL FILTER
MEC 3810-287-15/3-46

Figure 3-46. Alternator drive pulley, removal and installation.

is defective and not the removal of the harness assembly. In most instances, it is better to disconnect the defective wire at each end, and connect a new wire outside the harness.

c. *Testing.* Using a test light or ohmmeter, connect one probe to each end of the wire

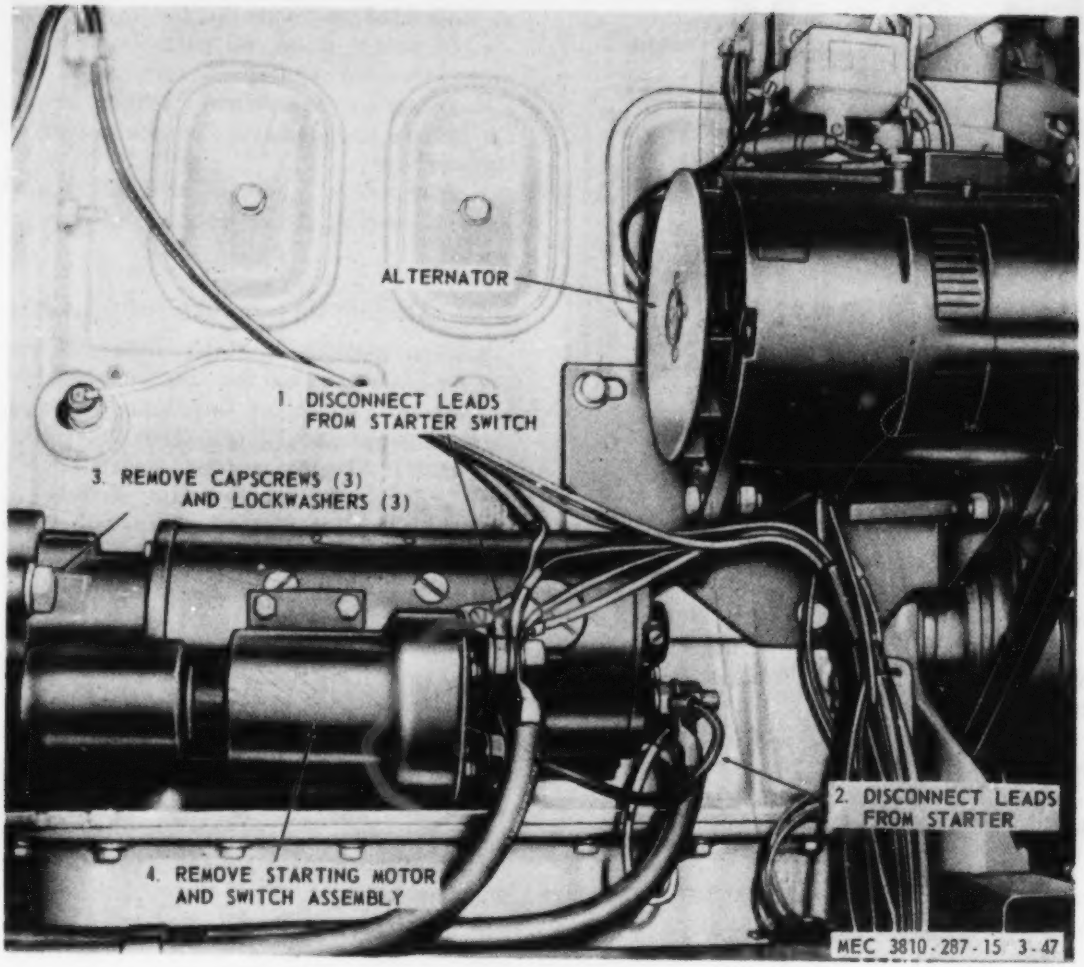

ALTERNATOR
1. DISCONNECT LEADS FROM STARTER SWITCH
3. REMOVE CAPSCREWS (3) AND LOCKWASHERS (3)
2. DISCONNECT LEADS FROM STARTER
4. REMOVE STARTING MOTOR AND SWITCH ASSEMBLY
MEC 3810-287-15 3-47

Figure 3-47. Starting motor, removal and installation.

suspected of being defective and test for continuity. If no continuity exists, replace the wire.

d. Installation. Refer to the wiring diagram (fig. 1-7) and replace defective wiring as required.

3-69. Ammeter

a. General. The ammeter is located in the instrument panel and wired into the electrical circuit between the alternator and batteries. It indicates the charging rate of the alternator.

b. Removal. Remove the ammeter as instructed on figure 3-51.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for damage. Replace damaged parts.

e. Installation. Install the ammeter in reverse of the instructions on figure 3-51.

3-70. Fuel Gage

a. General. The fuel gage is located in the instrument panel and indicates the fuel level in the fuel tank.

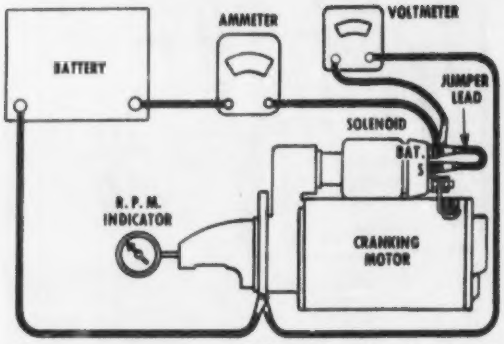


Figure 3-48. Starting motor free speed test diagram.

b. Removal. Remove the fuel gage as instructed on figure 3-51.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for defects and damage. Replace defective or damaged parts.

e. Installation. Install the fuel gage in reverse of the instructions on figure 3-51.

3-71. Temperature Gage

a. General. The temperature gage is located in the instrument panel and indicates the coolant temperature of the engine cooling system.

b. Removal. Remove the temperature gage as instructed on figure 3-51.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for defects and damage. Replace defective or damaged parts.

e. Installation. Install the temperature gage in reverse of the instructions on figure 3-51.

3-72. Oil Pressure Gage

a. General. The oil pressure gage is located in the instrument panel and indicates the engine oil pressure.

b. Removal. Remove the oil pressure gage as instructed on figure 3-51.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for defects and damage. Replace defective or damaged parts.

e. Installation. Install the oil pressure gage in reverse of the instructions on figure 3-51.

3-73. Sending Units and Warning Switches

a. General. The sending units and warning switches used on the crane-shovel provide the ground contact for each individual circuit through a resistance unit. The sending units are used in the temperature gage circuit and fuel gage circuit, and warning switches are used in the oil pressure warning system and temperature warning system.

Note. **If the high temperature or low oil pressure indicator lights light up during operation, immediately stop engine and determine cause.**

b. Removal. Remove the sending units and warning switches as instructed on figure 3-52.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for defects and damage. Replace defective or damaged parts.

e. Installation. Install the sending units and warning switches in reverse of the instructions on figure 3-52.

3-74. Floodlights

a. General. The floodlights are mounted on the upper front cab panels and right and left front of the turntable bed. They provide illumination for working at night. They are adjustable and equipped with replaceable lamps.

b. Removal. Remove the floodlights as instructed on figure 3-53.

c. Lamp Replacement. Replace the lamp as instructed on figure 3-54.

d. Installation. Install the floodlights in reverse of the instructions on figure 3-53.

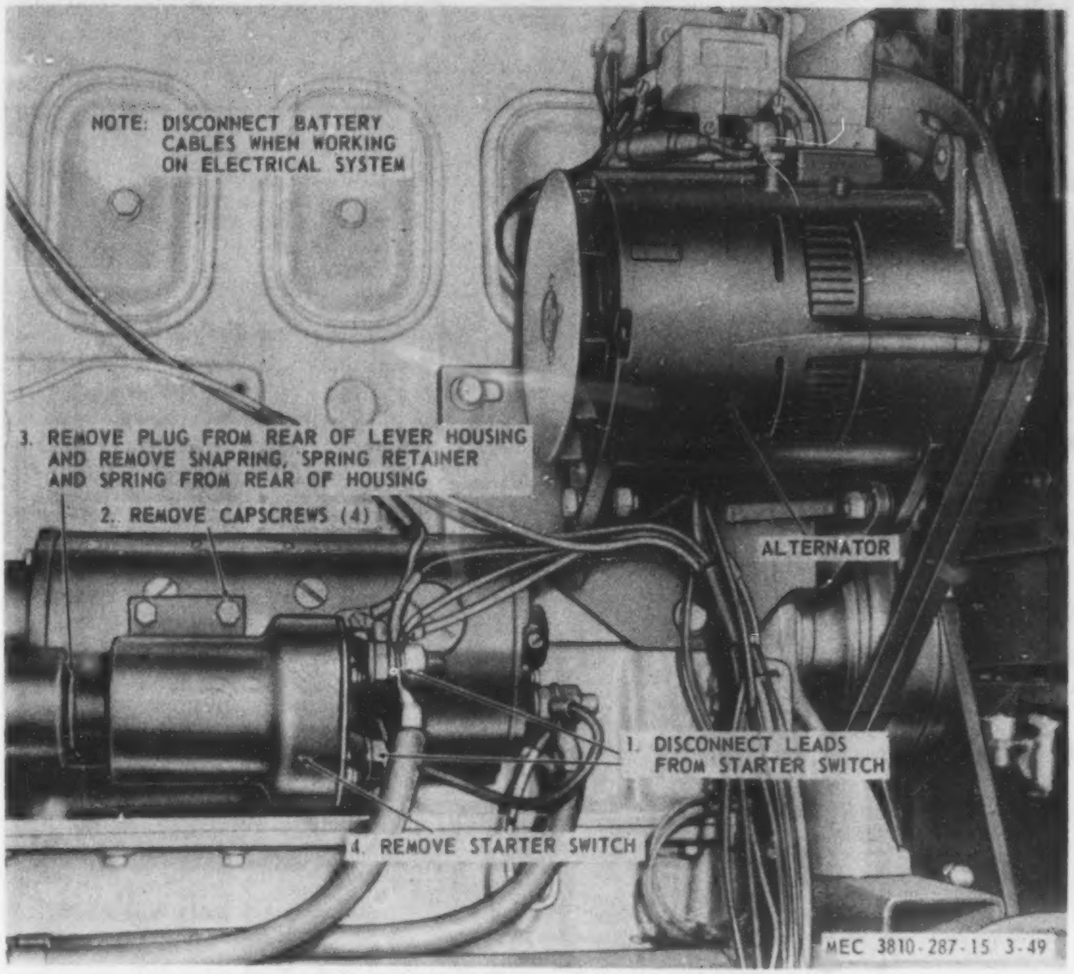

NOTE: DISCONNECT BATTERY CABLES WHEN WORKING ON ELECTRICAL SYSTEM
3. REMOVE PLUG FROM REAR OF LEVER HOUSING AND REMOVE SNAPRING, SPRING RETAINER AND SPRING FROM REAR OF HOUSING
2. REMOVE CAPSCREWS (4)
ALTERNATOR
1. DISCONNECT LEADS FROM STARTER SWITCH
4. REMOVE STARTER SWITCH
MEC 3810-287-15 3-49

Figure 3-49. Starting motor switch, removal and installation.

3-75. Horn

a. General. The horn is located under the turntable bed and controlled from the operator's compartment. It is used to signal trucks, ground men, and as a general warning and signal device.

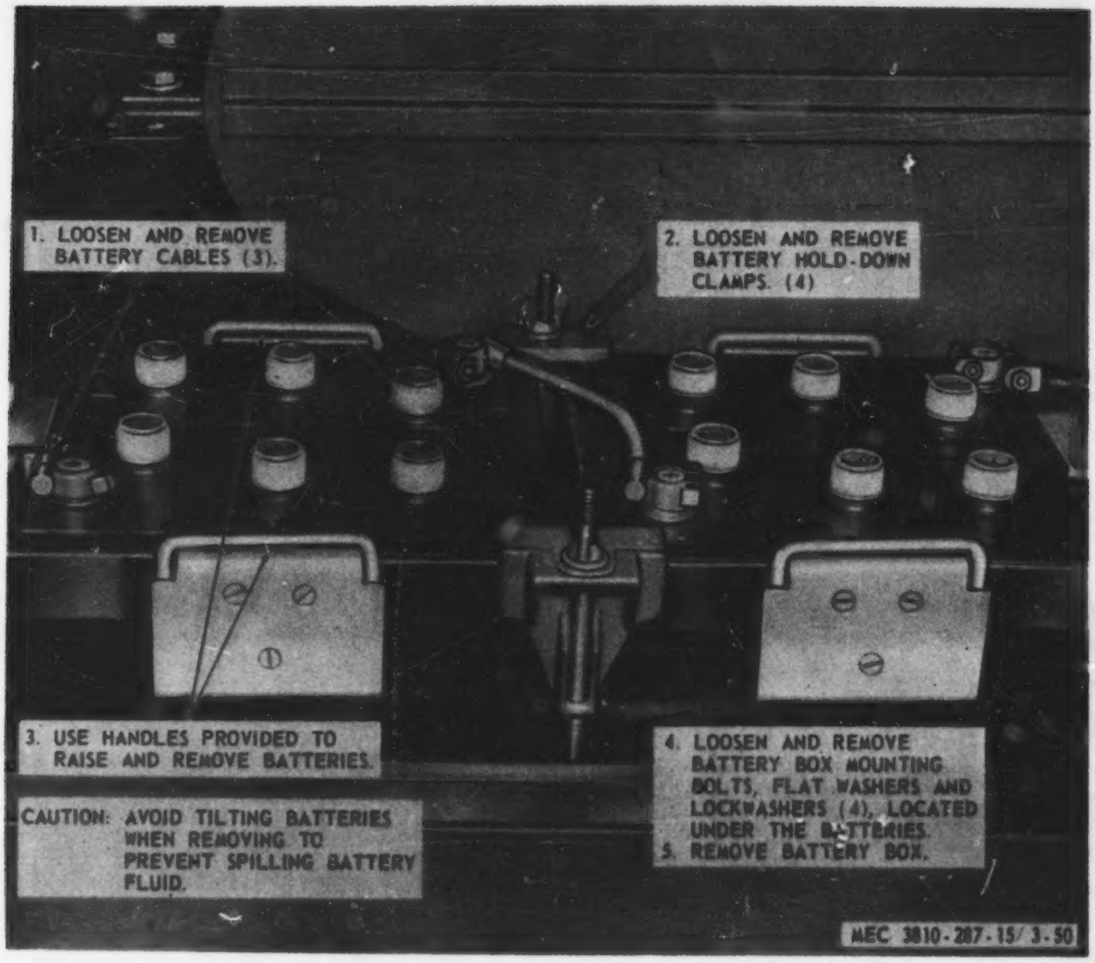
b. Removal. Remove the horn as instructed on figure 3-55.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for defects, damage, and proper operation. Replace defective, damaged, or non-operative parts.

e. Adjustment. Adjust the horn as instructed on figure 3-55.

f. Installation. Install the horn in reverse of the instructions on figure 3-55.


1. LOOSEN AND REMOVE BATTERY CABLES (3).

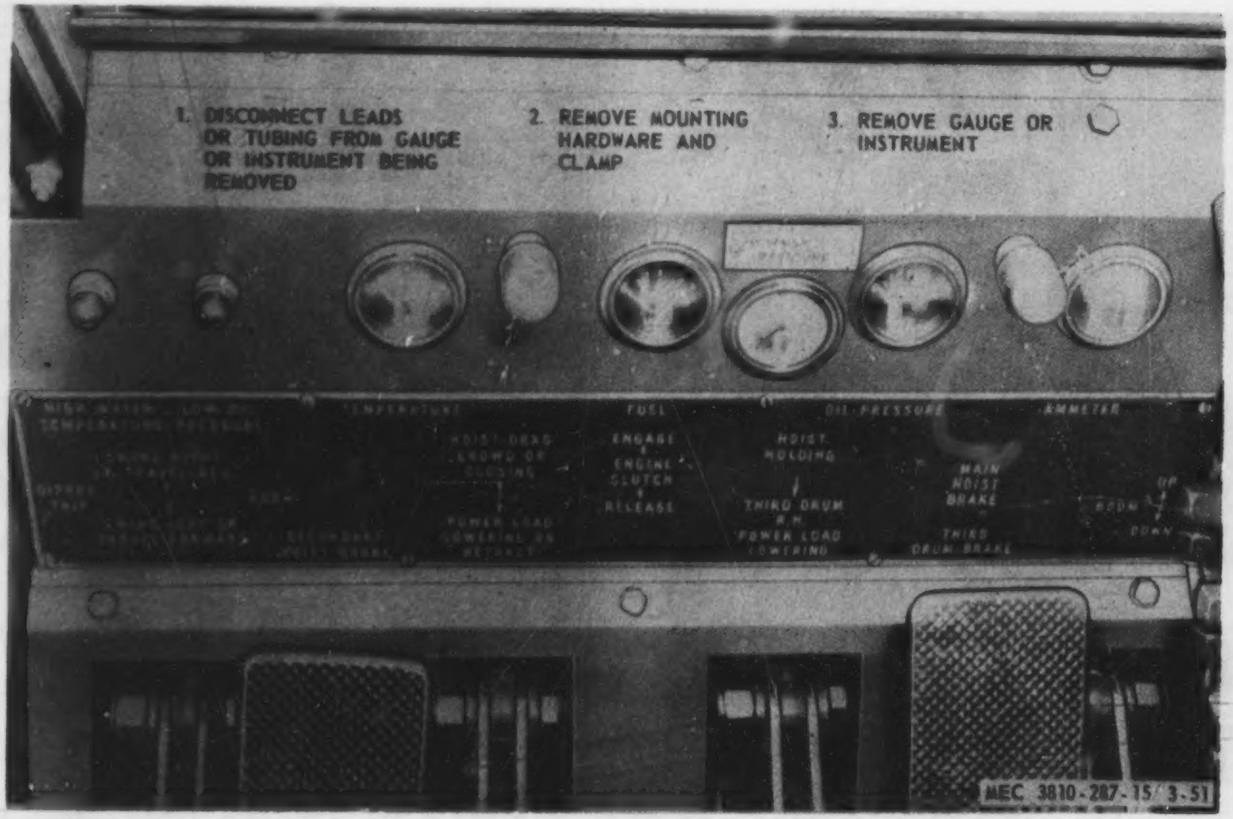
2. LOOSEN AND REMOVE BATTERY HOLD-DOWN CLAMPS. (4)

3. USE HANDLES PROVIDED TO RAISE AND REMOVE BATTERIES.

CAUTION: AVOID TILTING BATTERIES WHEN REMOVING TO PREVENT SPILLING BATTERY FLUID.

4. LOOSEN AND REMOVE BATTERY BOX MOUNTING BOLTS, FLAT WASHERS AND LOCKWASHERS (4), LOCATED UNDER THE BATTERIES.
5. REMOVE BATTERY BOX.

Figure 3-50. Batteries, battery box and cables, removal and installation.



1. DISCONNECT LEADS OR TUBING FROM GAUGE OR INSTRUMENT BEING REMOVED
2. REMOVE MOUNTING HARDWARE AND CLAMP
3. REMOVE GAUGE OR INSTRUMENT

HIGH WATER TEMPERATURE
LOW OIL PRESSURE
TEMPERATURE
FUEL
OIL PRESSURE
AMMETER
HOIST DRAG CROWD OR CLOSING
POWER LOAD LOWERING OR RETRACT
ENGAGE
ENGINE CLUTCH
RELEASE
HOIST HOLDING
THIRD DRUM R.H.
POWER LOAD LOWERING
MAIN HOIST BRAKE
THIRD DRUM BRAKE
UP
BOOM
DOWN
MEC 3810-287-15/3-51

Figure 3-51. Instruments, gages, and switches, removal and installation

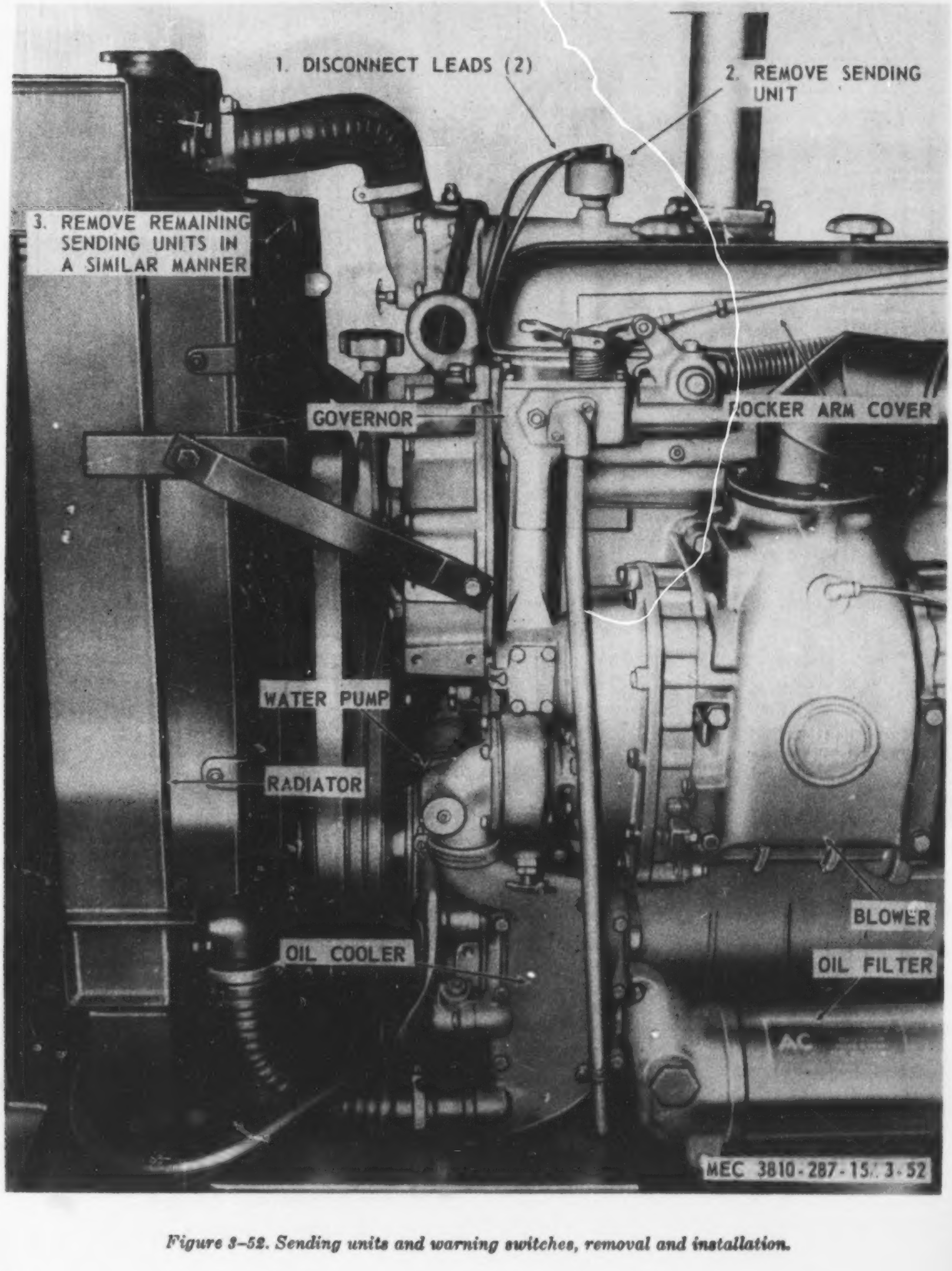

1. DISCONNECT LEADS (2)
2. REMOVE SENDING UNIT
3. REMOVE REMAINING SENDING UNITS IN A SIMILAR MANNER
GOVERNOR
ROCKER ARM COVER
WATER PUMP
RADIATOR
OIL COOLER
BLOWER
OIL FILTER
MEC 3810-287-15/3-52

Figure 3-52. Sending units and warning switches, removal and installation.

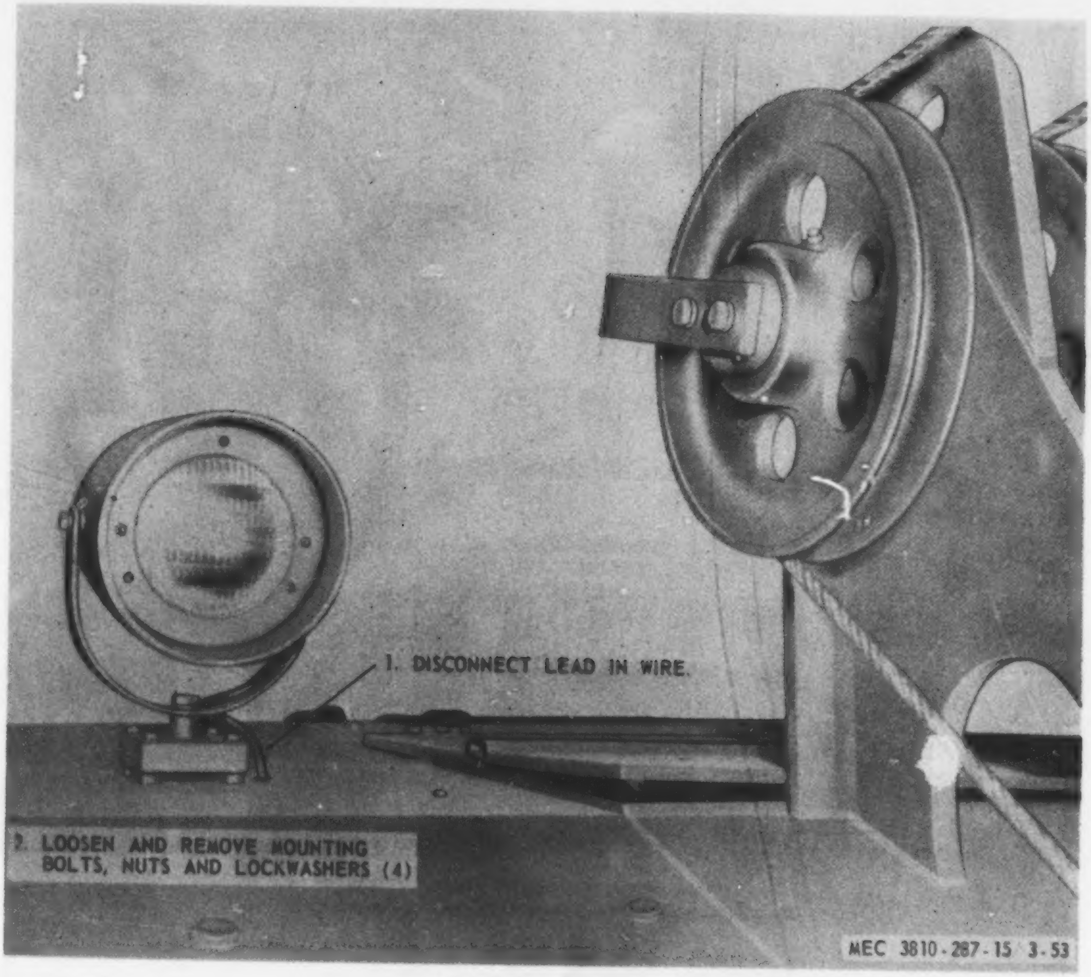

1. DISCONNECT LEAD IN WIRE.
2. LOOSEN AND REMOVE MOUNTING BOLTS, NUTS AND LOCKWASHERS (4)
MEC 3810-287-15 3-53

Figure 3-53. Floodlights, removal and installation.

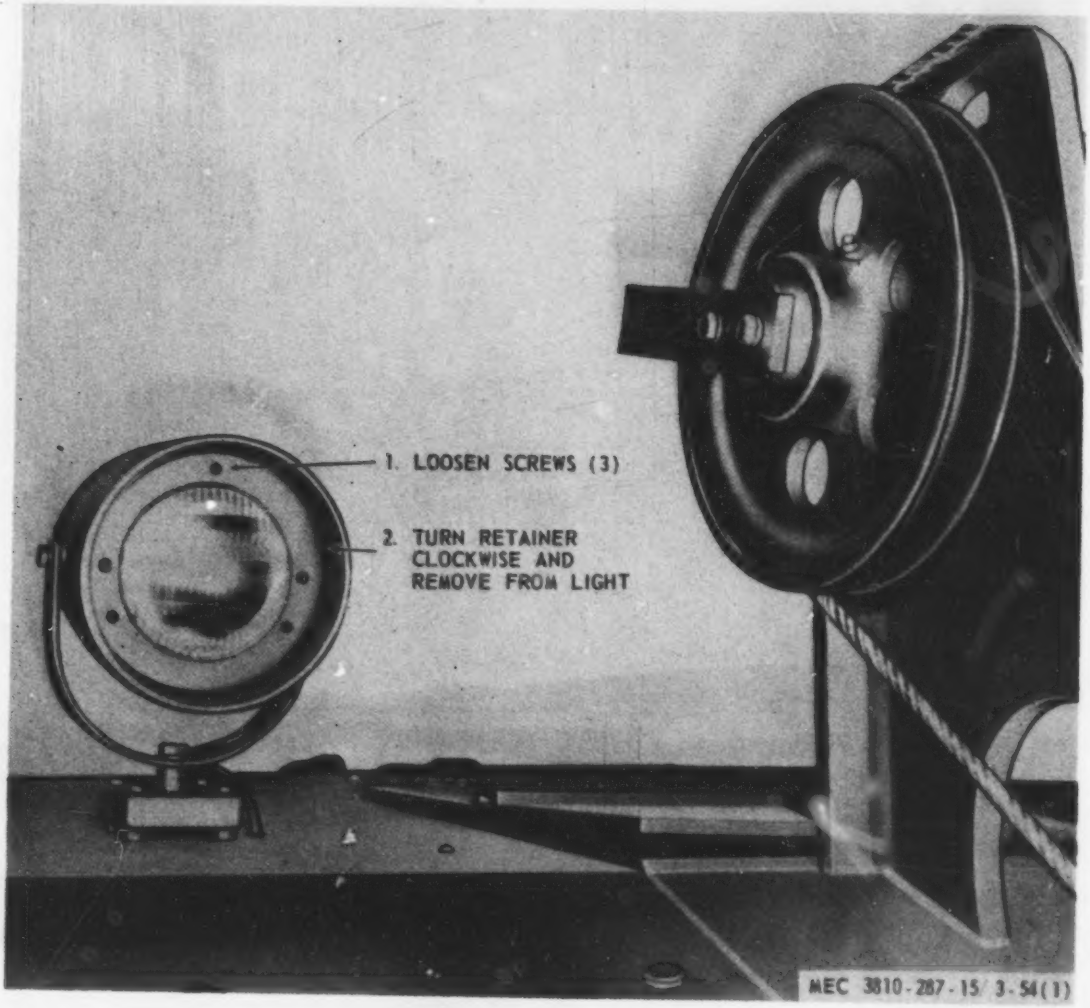

1. LOOSEN SCREWS (3)
2. TURN RETAINER CLOCKWISE AND REMOVE FROM LIGHT
MEC 3810-287-15/3-54(1)

Figure 3–54 (1). Lamp replacement.

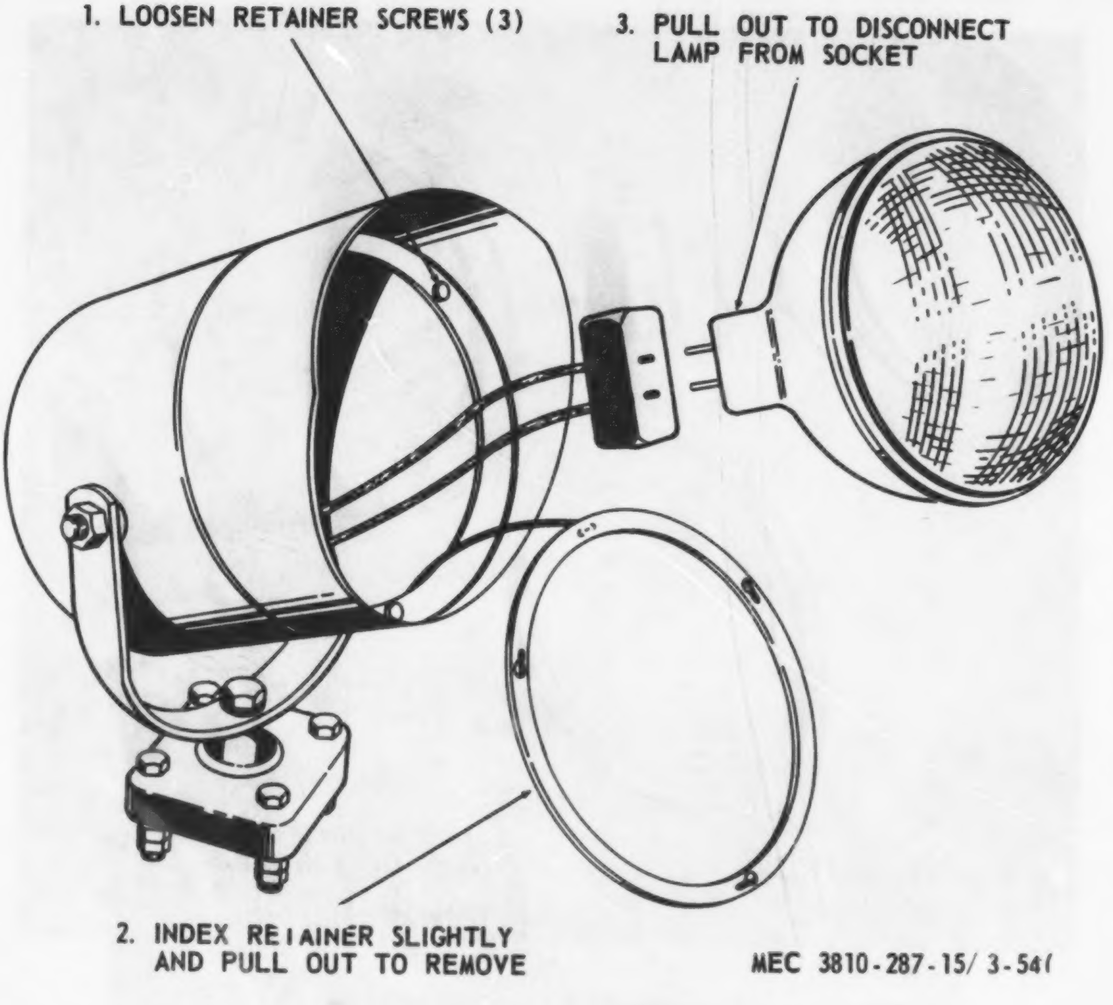

1. LOOSEN RETAINER SCREWS (3)
3. PULL OUT TO DISCONNECT LAMP FROM SOCKET
2. INDEX RETAINER SLIGHTLY AND PULL OUT TO REMOVE
MEC 3810-287-15/ 3-54(

Figure 3-54 (2).—Continued.

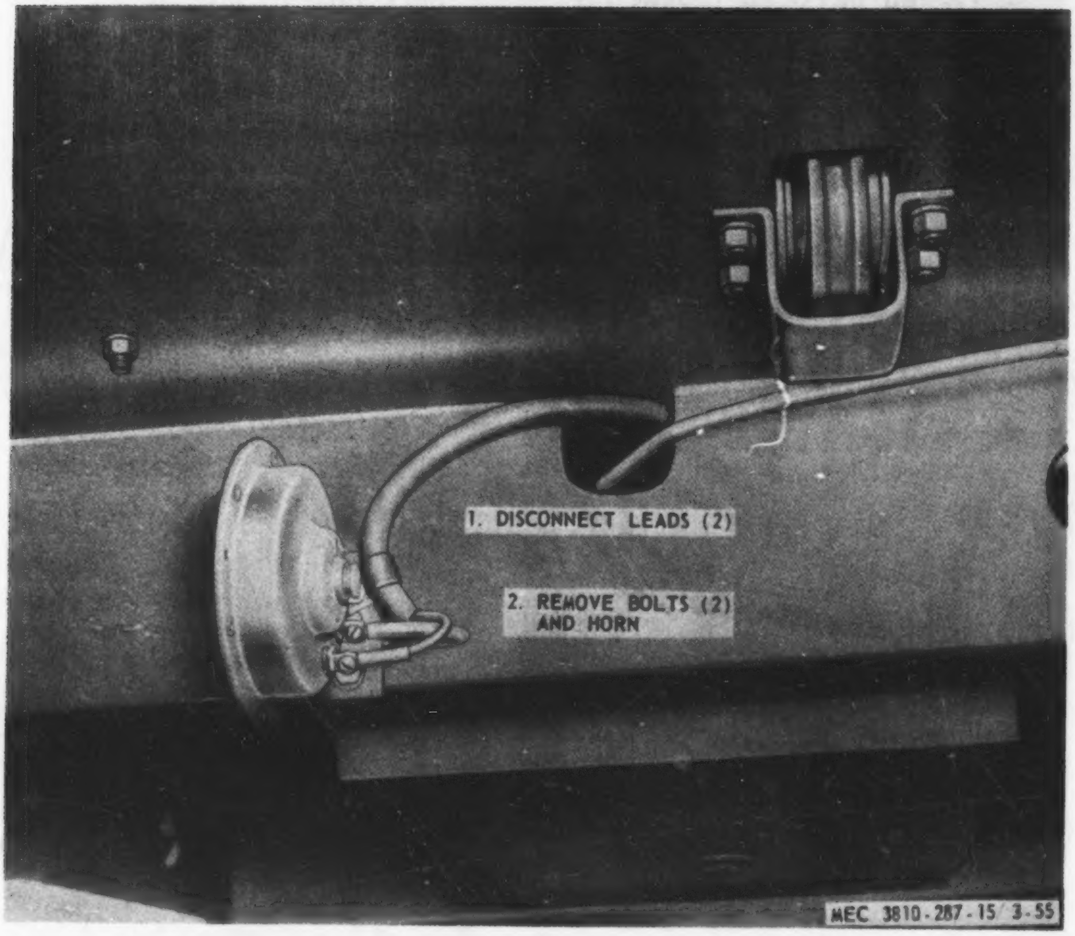


Figure 3-55. Horn, removal and installation.

Section X. LUBRICATION SYSTEM

3-76. Oil Cooler Assembly

a. General. The oil cooler assembly is located on the left lower front corner of the engine. It contains a core assembly, through which the engine oil passes. The outer part of the core is surrounded by coolant from the cooling system.

b. Removal. Remove the oil cooler assembly as instructed on figure 3-56.

c. Disassembly. Disassemble the oil cooler assembly as illustrated on figure 3-57.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for defects and damage. Replace defective or damaged parts.

f. Reassembly. Reassemble the oil cooler assembly as illustrated on figure 3-57.

g. Installation. Install the oil cooler assembly in reverse of the instructions on figure 3-56.

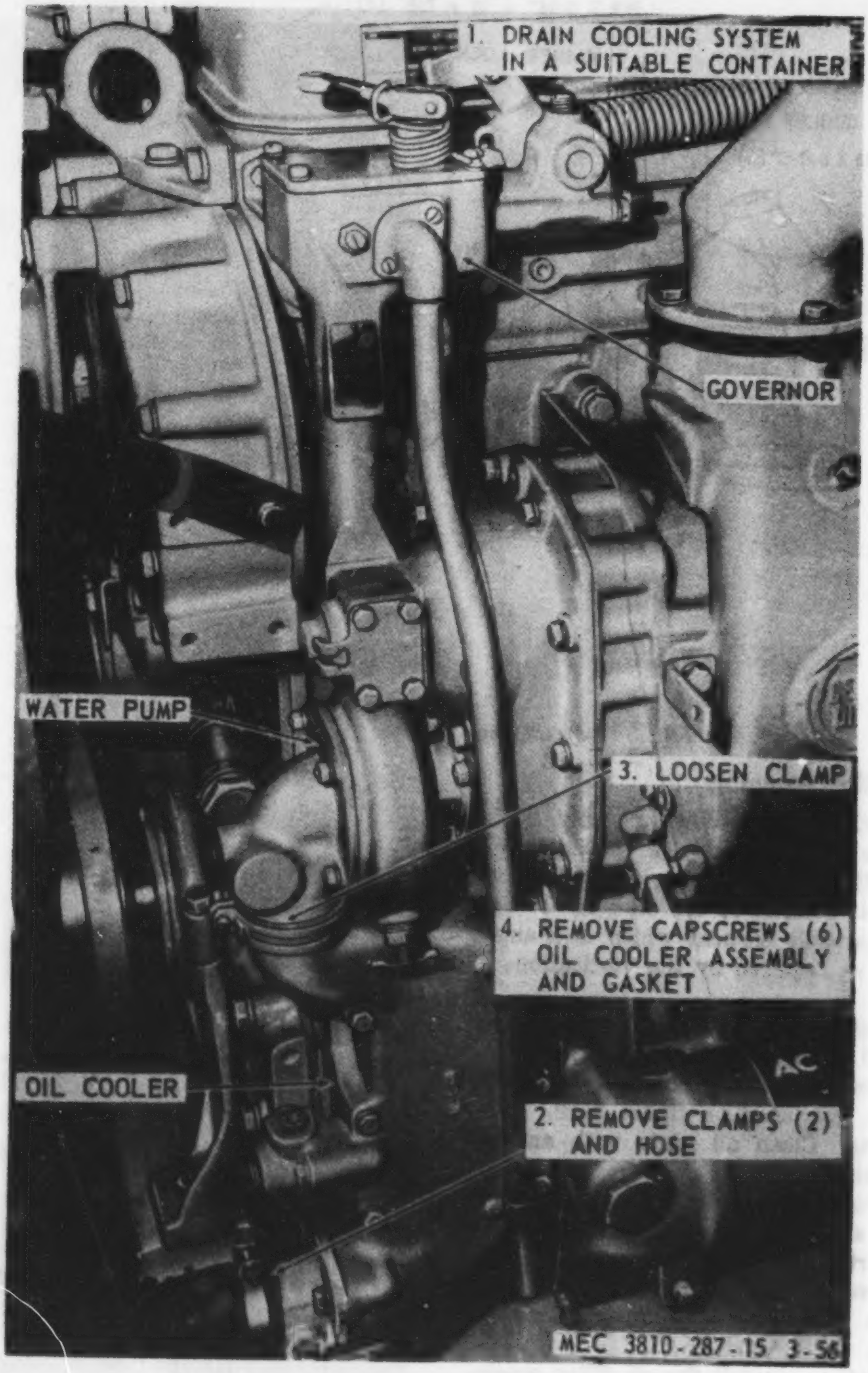

1. DRAIN COOLING SYSTEM IN A SUITABLE CONTAINER
GOVERNOR
WATER PUMP
3. LOOSEN CLAMP
4. REMOVE CAPSCREWS (6) OIL COOLER ASSEMBLY AND GASKET
OIL COOLER
2. REMOVE CLAMPS (2) AND HOSE
MEC 3810-287-15 3-56

Figure 3-56. Oil cooler assembly, removal and installation.

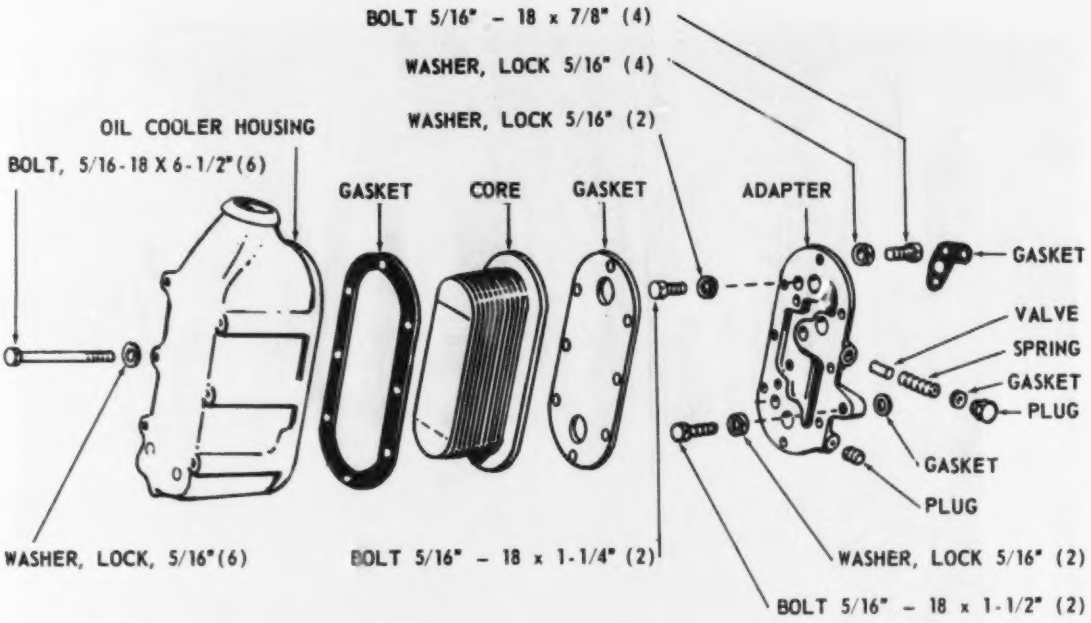

BOLT 5/16" - 18 x 7/8" (4)
WASHER, LOCK 5/16" (4)
WASHER, LOCK 5/16" (2)
OIL COOLER HOUSING
BOLT, 5/16-18 X 6-1/2" (6)
GASKET
CORE
GASKET
ADAPTER
GASKET
VALVE
SPRING
GASKET
PLUG
GASKET
PLUG
WASHER, LOCK, 5/16" (6)
BOLT 5/16" - 18 x 1-1/4" (2)
WASHER, LOCK 5/16" (2)
BOLT 5/16" - 18 x 1-1/2" (2)
MEC 3810-287-15/ 3-57

Figure 3-57. Oil cooler assembly, exlpoded view.

3-77. Oil Filter Assembly

a. General. The oil filter assembly is located on the lower left side of the engine. It filters the oil from the engine lubricating system before it returns to the oil pan. It contains a replaceable element which is changed periodically as required by the lubrication order.

b. Removal. Remove the oil filter assembly as instructed on figure 3-58.

c. Disassembly. Disassemble the oil filter assembly as instructed on figure 3-59.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for defects and damage. Replace defective or damaged parts.

f. Reassembly. Reassemble the oil filter assembly in reverse of the instructions on figure 3-59.

g. Installation. Install the oil filter assembly in reverse of the instructions on figure 3-58.

3-78. By-pass Valves

a. General. The engine is equipped with two external oil by-pass valves. One is located in the oil cooler adapter, the other in the oil filter adapter housing. The purpose of these valves is to maintain a constant pressure in the lubricating system, and to by-pass excessive oil back to the crankcase.

b. Removal. Refer to figures 3-57 and 3-59 and remove the oil cooler by-pass valve assembly and the oil filter by-pass valve assembly.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

(2) Inspect the valves for nicks, burrs and other damage which may prevent proper seating. Replace a damaged or worn valve.

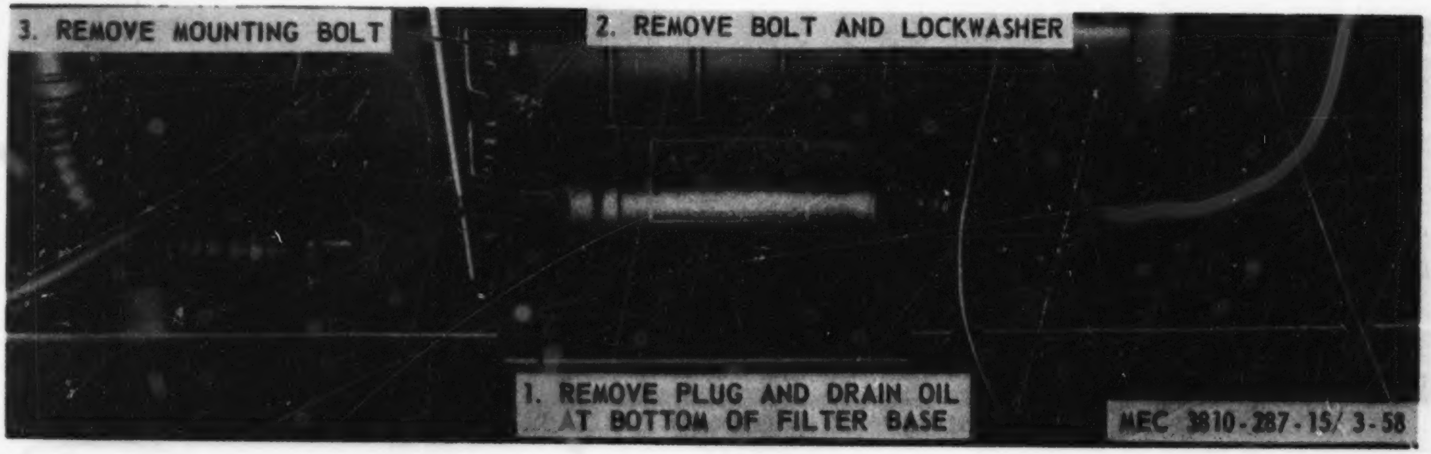
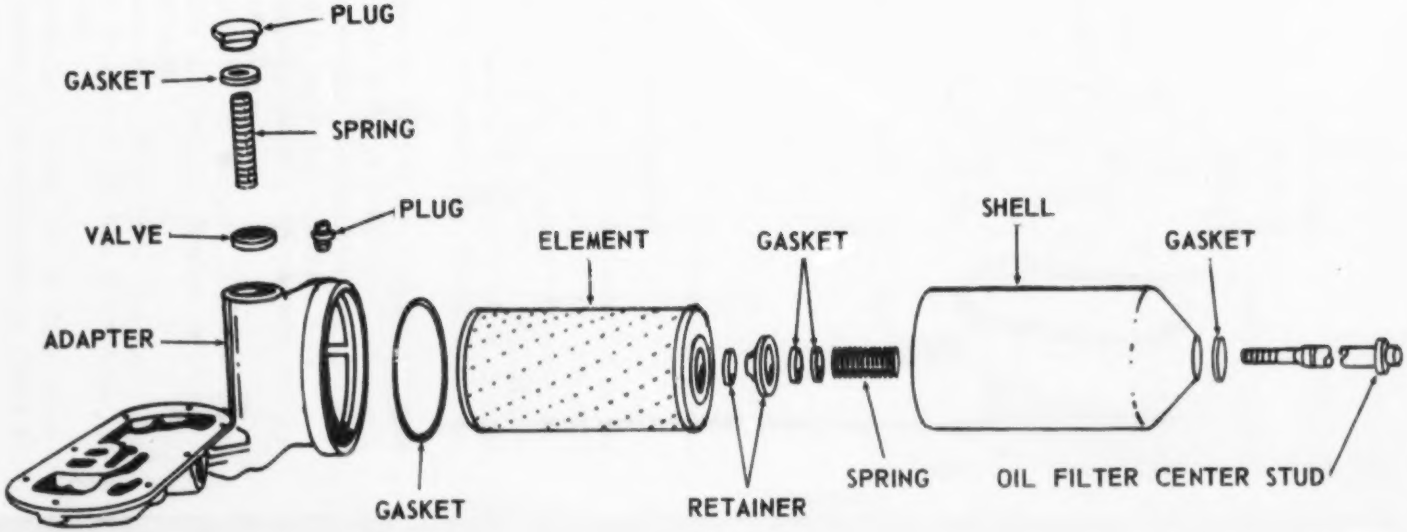

3. REMOVE MOUNTING BOLT
2. REMOVE BOLT AND LOCKWASHER
1. REMOVE PLUG AND DRAIN OIL AT BOTTOM OF FILTER BASE
MEC 3810-287-15/3-58

Figure 3-58. Oil filter assembly, removal and installation.


PLUG
GASKET
SPRING
PLUG
VALVE
ELEMENT
GASKET
SHELL
GASKET
ADAPTER
GASKET
RETAINER
SPRING
OIL FILTER CENTER STUD

MEC 3810-287-15/3-59

Figure 3–59. Oil filter assembly, exploded view.

(3) Inspect the seats in the oil filter and oil cooler adapter housing for dirt or other obstructions which could hold the valves open.

(4) Check the oil filter valve spring tension. The valve spring requires a force of 10 1/2 pounds to compress it to a length of 2.50 inches.

e. Installation. Install the by-pass valve assemblies in reverse of the instructions on figures 3-57 and 3-59.

Section XI. EXHAUST SYSTEM

3-79. Muffler and Exhaust Pipe

a. General. The exhaust pipe extends from the engine exhaust manifold through the cab, and is attached to the muffler at the rear of the machine.

b. Removal. Remove the guard muffler and exhaust pipe as instructed on figure 3-58.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair.

(1) Inspect the exhaust pipe and muffler for rust, holes, and other damage. Replace a damaged or defective exhaust pipe or muffler.

(2) Inspect all mounting brackets and hardware for defects and damage. Replace defective or damaged parts.

e. Installation. Install the exhaust pipe and muffler in reverse of the instructions on figure 3-60.

3-80. Exhaust Manifold

a. General. The exhaust manifold is located on the right side of the engine and attached to the cylinder head. It directs the exhaust gages from the engine to the exhaust pipe and subsequently through the muffler to atmosphere.

b. Removal. Remove the guard and exhaust manifold as instructed on figure 3-59.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for cracks, defects and damage. Replace cracked, defective, or damaged parts.

e. Installation. Install the exhaust manifold and guard in reverse of the instructions on figure 3-61.

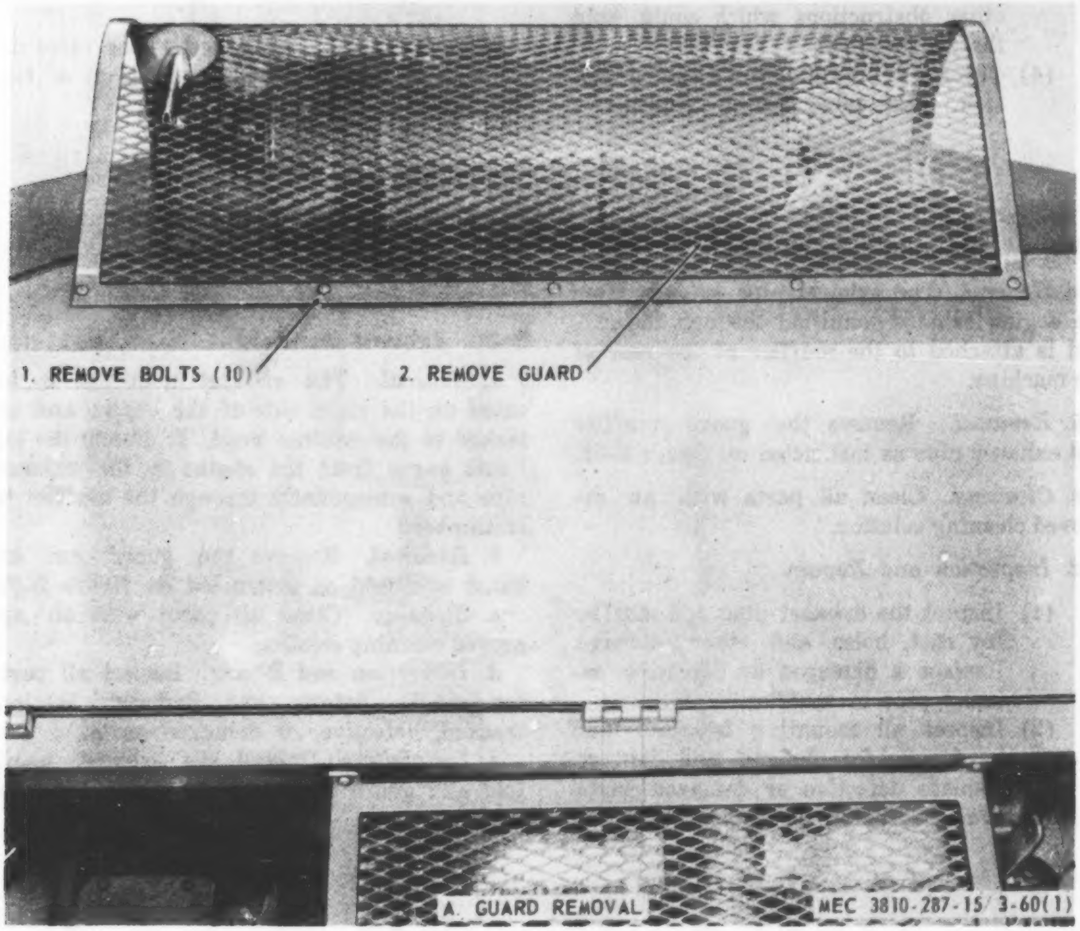

1. REMOVE BOLTS (10)
2. REMOVE GUARD
A. GUARD REMOVAL
MEC 3810-287-15/3-60(1)

Figure 3-60 (1). Muffler and exhaust pipe, removal and installation.

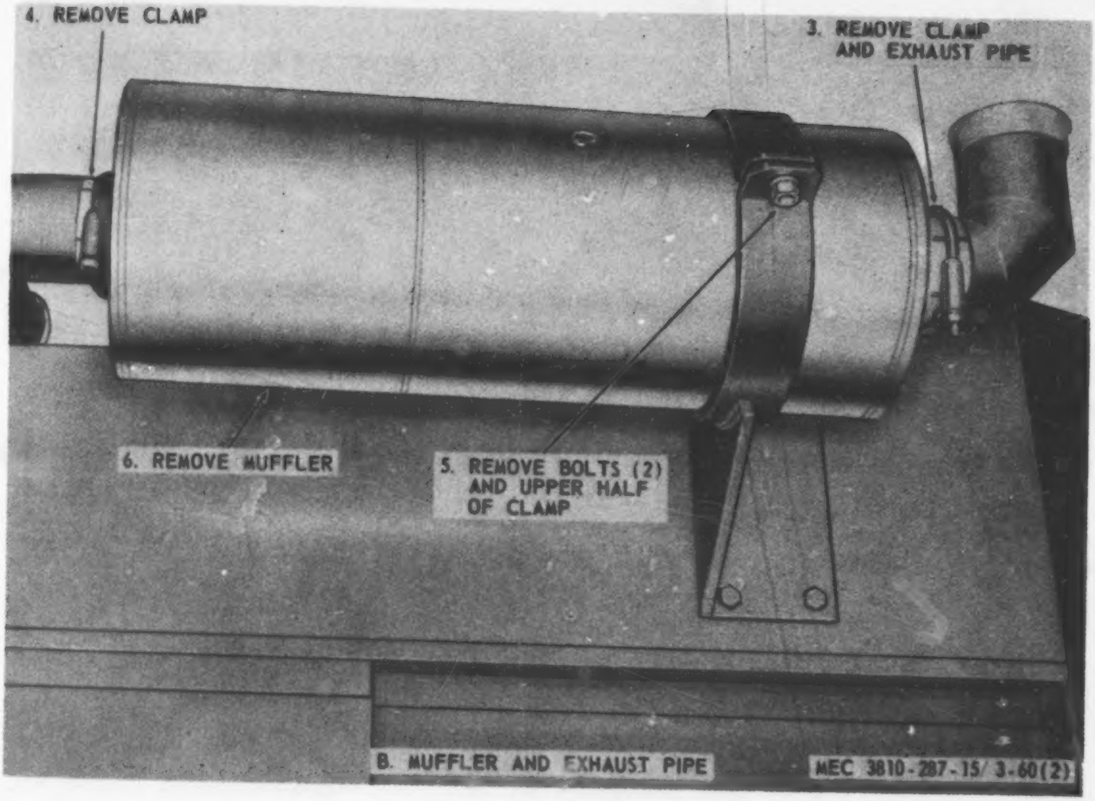

4. REMOVE CLAMP
3. REMOVE CLAMP AND EXHAUST PIPE
6. REMOVE MUFFLER
5. REMOVE BOLTS (2) AND UPPER HALF OF CLAMP
B. MUFFLER AND EXHAUST PIPE
MEC 3810-287-15/3-60(2)

Figure 3-60 (2).—Continued.

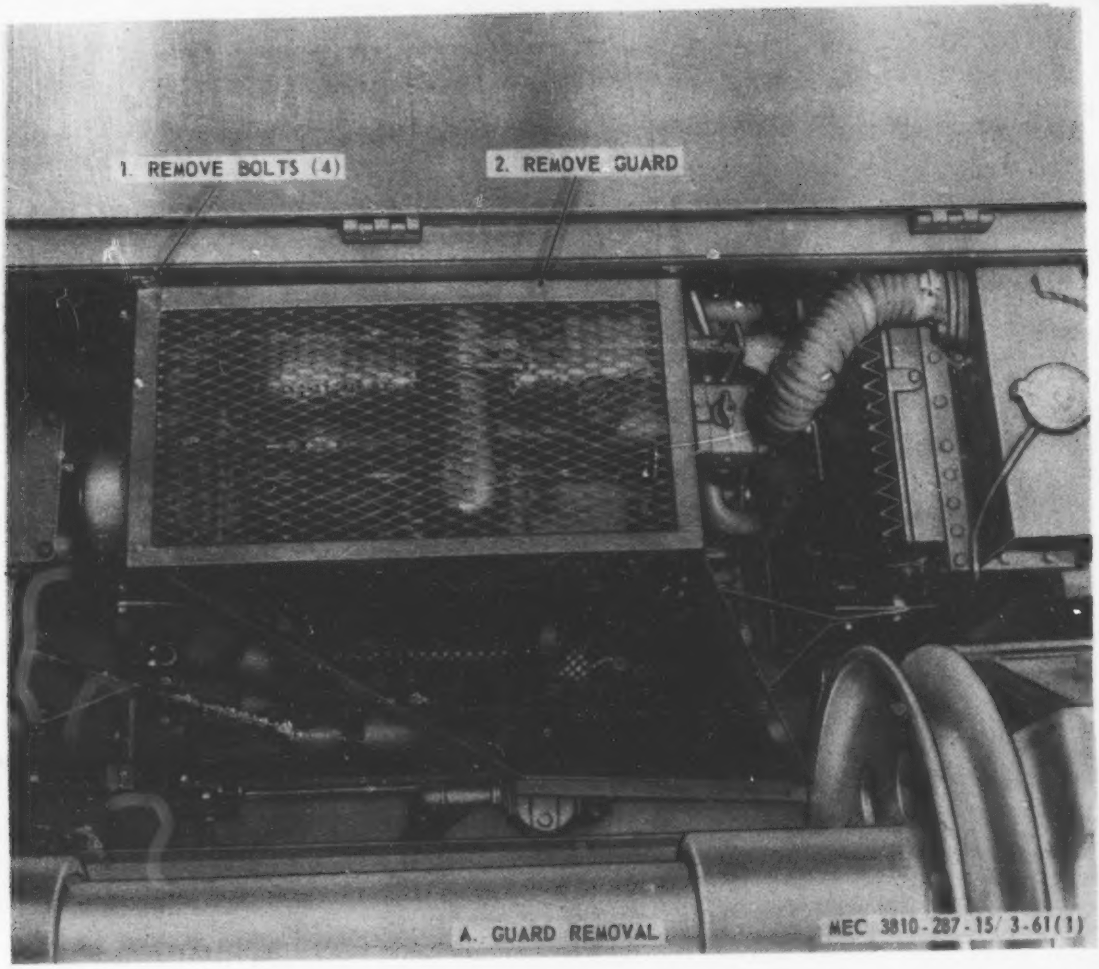

1. REMOVE BOLTS (4)
2. REMOVE GUARD
A. GUARD REMOVAL
MEC 3810-287-15/3-61(1)

Figure 3-61 (1). Exhaust manifold, removal and installation.

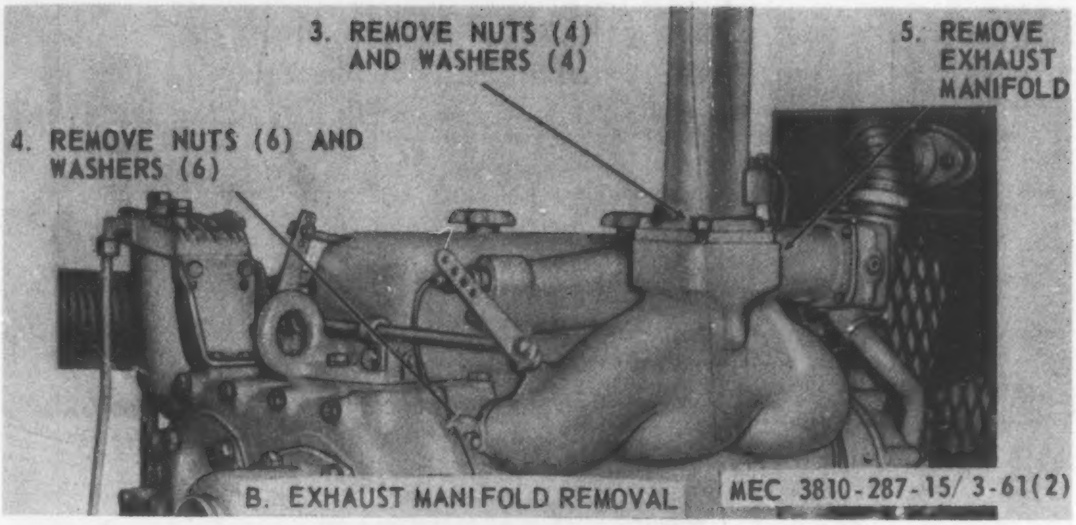

3. REMOVE NUTS (4) AND WASHERS (4)
5. REMOVE EXHAUST MANIFOLD
4. REMOVE NUTS (6) AND WASHERS (6)
B. EXHAUST MANIFOLD REMOVAL
MEC 3810-287-15/3-61(2)

Figure 3-61 (2).—Continued.

Section XII. OPERATING CONTROL LEVERS, PEDALS AND LINKAGE

3-81. Clutch Release Rods and Levers

a. General. The clutch release rods and levers extend from the operator's compartment to the engine clutch.

b. Removal. Remove the clutch release rods and levers as instructed on figure 3-62.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects, and damage. Replace worn, defective or damaged parts.

e. Installation. Install the clutch release rods and levers in reverse of the instruction on figure 3-62.

f. Adjustment. Adjust the clutch release rods and levers as instructed on figure 3-63.

3-82. Control Levers

a. General. The control levers are located in front of the operator's compartment and control the operation of the hoist, swing, travel, power load lowering, power boom lowering, and boom hoist clutches.

b. Removal. Remove the control levers as instructed on figure 3-64.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects, and damage. Replace worn, defective or damaged parts.

e. Installation. Install the control levers in reverse of the instructions on figure 3-64.

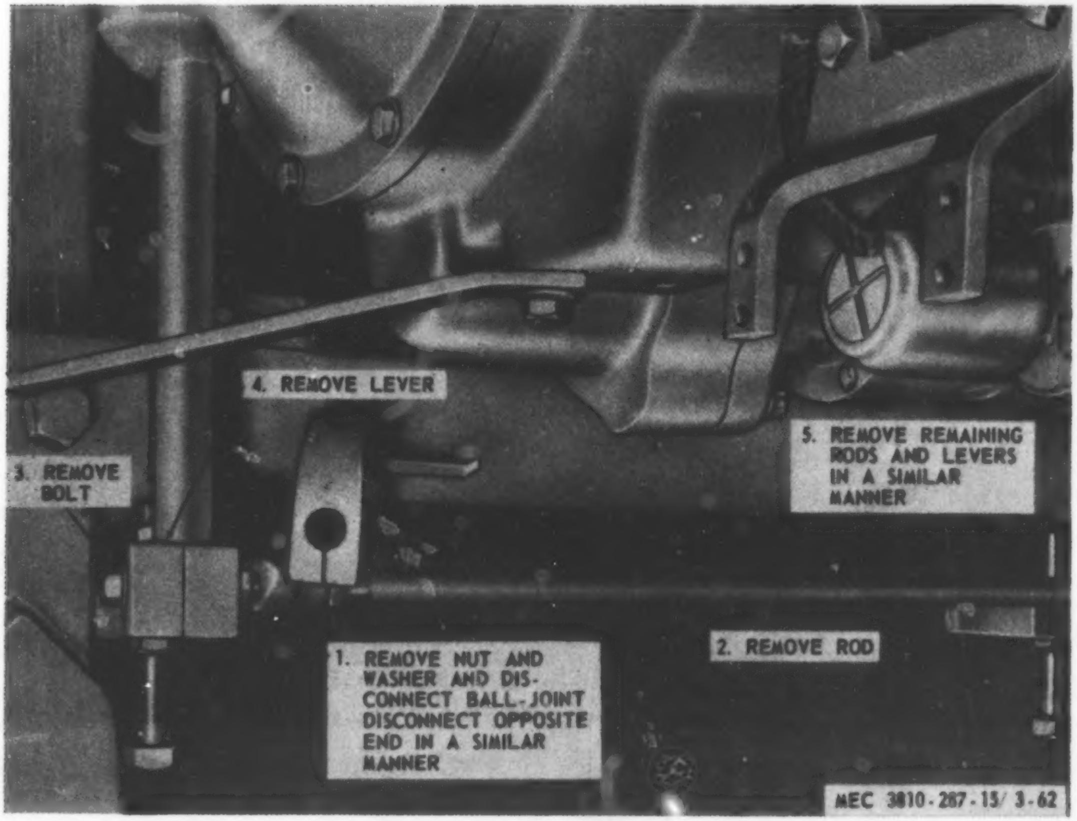

4. REMOVE LEVER
3. REMOVE BOLT
5. REMOVE REMAINING RODS AND LEVERS IN A SIMILAR MANNER
1. REMOVE NUT AND WASHER AND DISCONNECT BALL-JOINT DISCONNECT OPPOSITE END IN A SIMILAR MANNER
2. REMOVE ROD
MEC 3810-287-15/ 3-62

Figure 3-62. Clutch release rods and levers, exploded view.

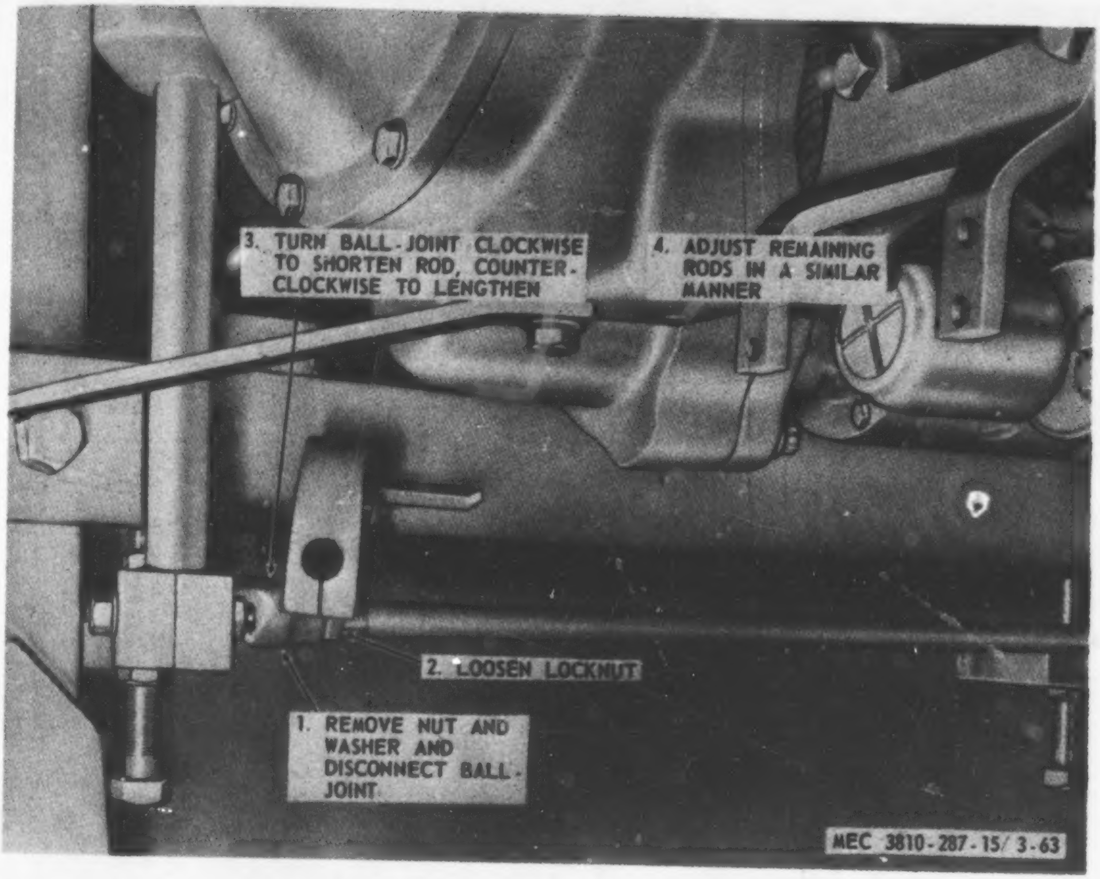

3. TURN BALL-JOINT CLOCKWISE TO SHORTEN ROD, COUNTER-CLOCKWISE TO LENGTHEN
4. ADJUST REMAINING RODS IN A SIMILAR MANNER
2. LOOSEN LOCKNUT
1. REMOVE NUT AND WASHER AND DISCONNECT BALL-JOINT
MEC 3810-287-15/3-63

Figure 3-63. Clutch release rods and levers, adjustment.

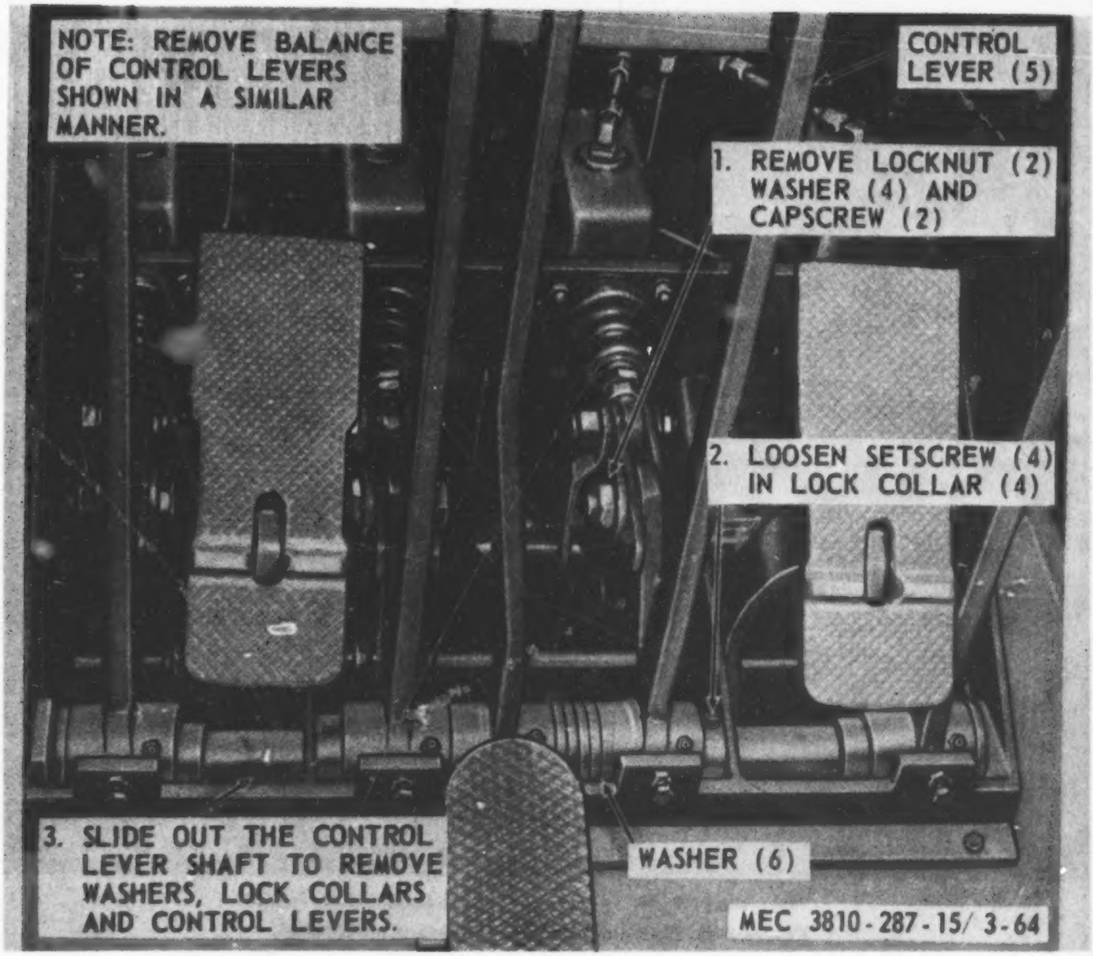

NOTE: REMOVE BALANCE OF CONTROL LEVERS SHOWN IN A SIMILAR MANNER.
CONTROL LEVER (5)
1. REMOVE LOCKNUT (2) WASHER (4) AND CAPSCREW (2)
2. LOOSEN SETSCREW (4) IN LOCK COLLAR (4)
3. SLIDE OUT THE CONTROL LEVER SHAFT TO REMOVE WASHERS, LOCK COLLARS AND CONTROL LEVERS.
WASHER (6)
MEC 3810-287-15/3-64

Figure 3-64. Control levers, removal and installation.

Section XIII. BODY, CAB, HOOD, AND HULL ASSEMBLIES

3-83. Cab Panels

a. General. The cab assembly is made up of individual panels which house the machinery and operator's compartment.

b. Removal. Remove the cab panels as instructed on figure 3-65.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for defects and damage. Inspect panels for dents and rust. Replace defective or damaged parts. Straighten bent or dented panels, and clean and repaint rusted areas.

e. Installation. Install the cab panels in reverse of the instructions on figure 3-65.

3-84. Doors

a. General. Doors are provided at the operator's compartment, the engine, right-hand machinery, and radiator opening. Flip-up

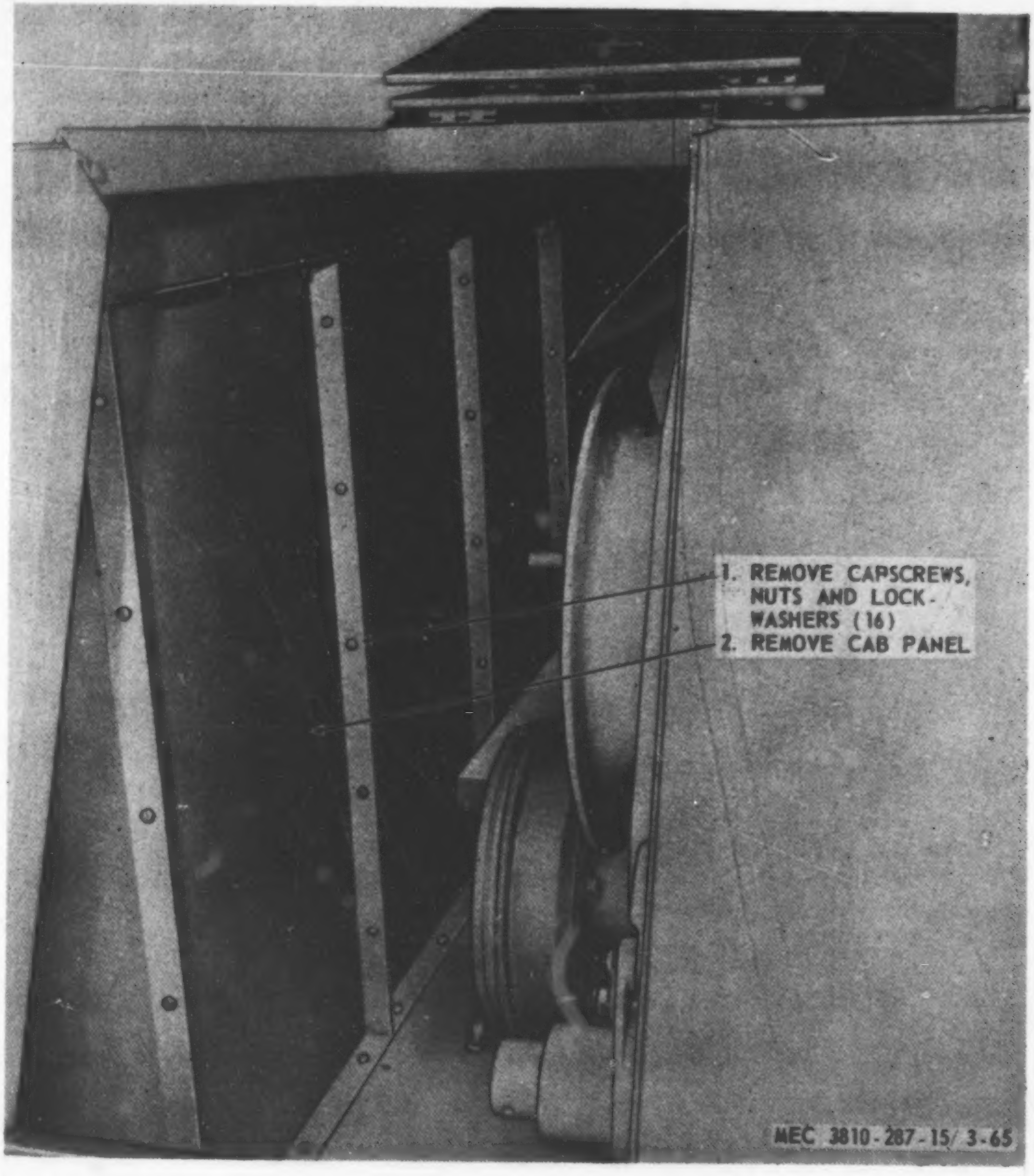

1. REMOVE CAPSCREWS, NUTS AND LOCK-WASHERS (16)
2. REMOVE CAB PANEL
MEC 3810-287-15/3-65

Figure 3-65. Cab panels, removal and installation.

doors are provided above the engine for servicing.

b. Removal. Remove the doors as instructed on figure 3-66.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects, and damage. Replace worn,

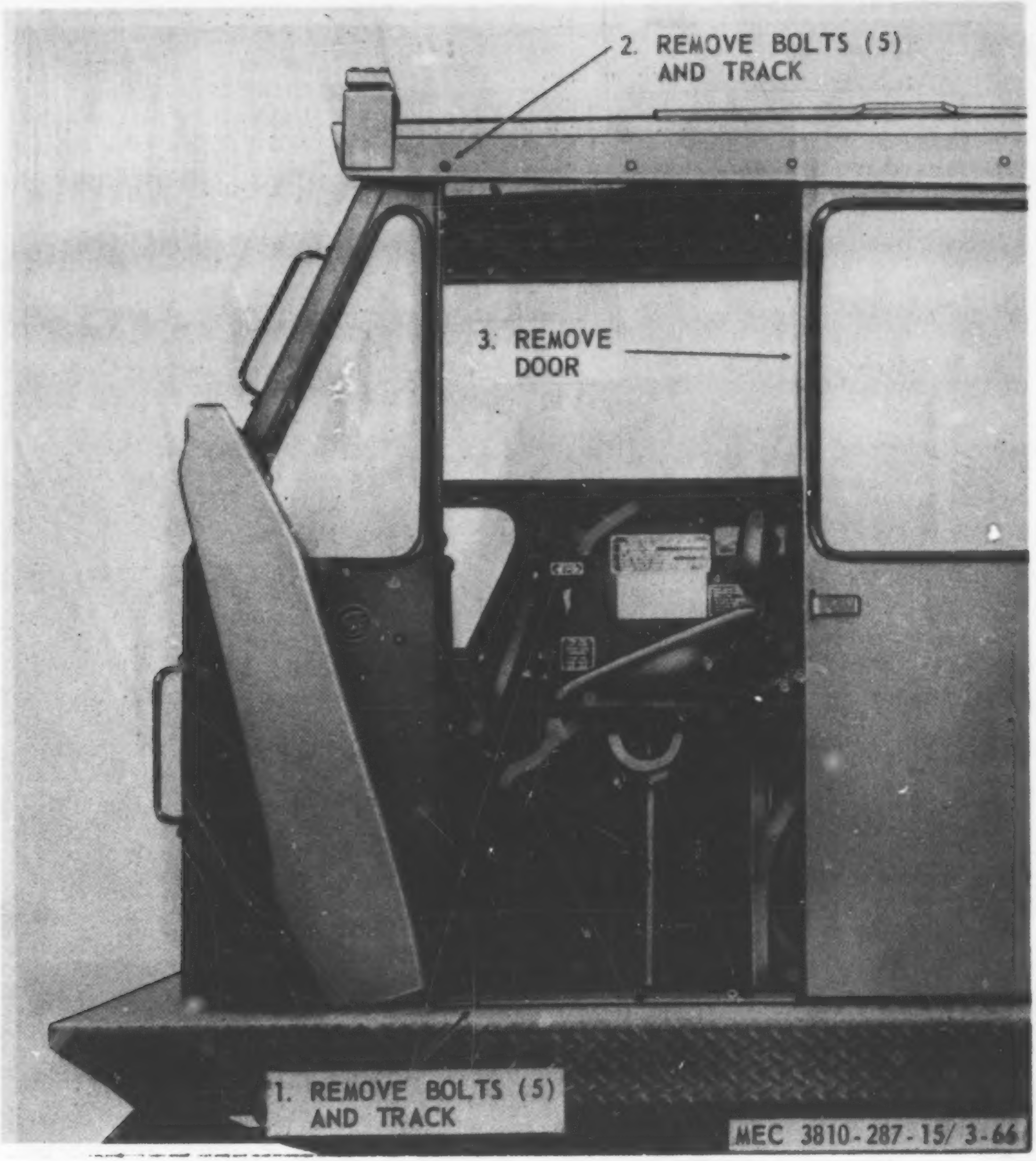

2. REMOVE BOLTS (5) AND TRACK
3. REMOVE DOOR
1. REMOVE BOLTS (5) AND TRACK
MEC 3810-287-15/ 3-66

Figure 3–66. Cab doors, removal and installation.

defective, or damaged parts. Inspect the doors for rust, dents, and other damage. Straighten dents, and clean and paint rusted areas. Replace a badly damaged door.

e. Installation. Install the doors in reverse of the instructions on figure 3–66.

3–85. Glass

a. General. The L–36M is equipped with a full-vision cab which incorporates glass completely around the operator. The glass is encased in a rubber molding which fits in the cab panel openings.

b. Removal. Remove the glass as instructed on figure 3-67.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for deflects and damage. Replace defective or damaged parts. Inspect the molding for signs of deterioration. Replace a deteriorated or broken molding.

e. Installation. Install the glass as instructed on figure 3-67.

3-86. Seat Assembly

a. General. The seat assembly is located in the operator's compartment. It is adjustable up and down, and tilts forward and back.

b. Removal. Remove the seat assembly as instructed on figure 3-68.

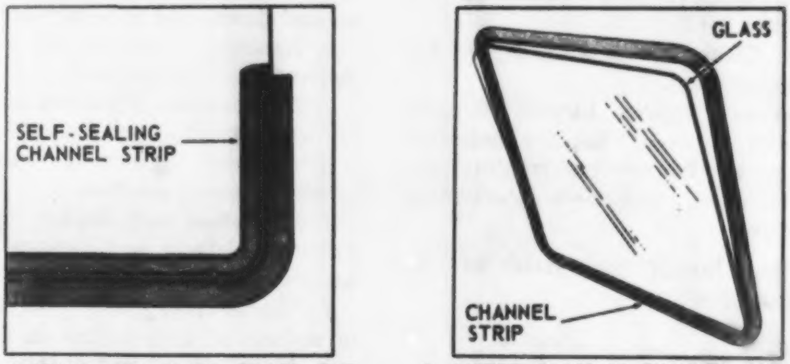
c. Disassembly. Disassemble the seat assembly as instructed on figure 3-69.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for wear, defects, and damage. Replace worn, defective, or damaged parts.

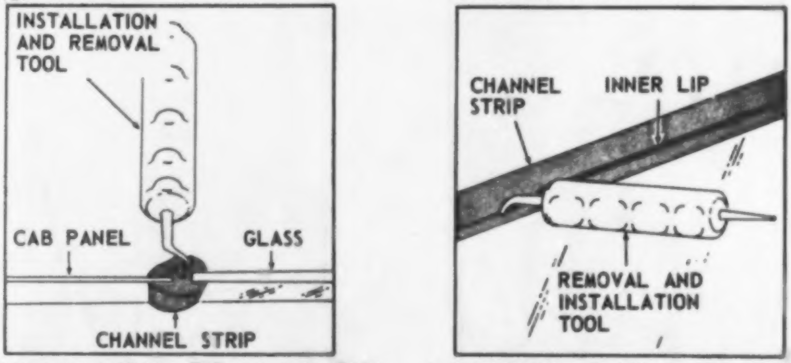
f. Reassembly. Reassemble the seat assembly in reverse of instructions on figure 3-69.

g. Installation. Install the seat assembly as instructed on figure 3-68.


SELF-SEALING CHANNEL STRIP
GLASS
CHANNEL STRIP

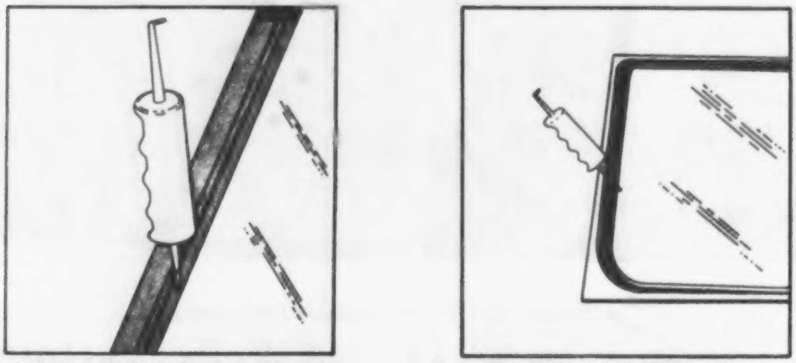
1. TO INSTALL NEW GLASS, PLACE THE CHANNEL STRIP ON CAB PANEL AND CUT STRIP TO OVERLAP STARTING POINT BY 1/8 INCH FOR EACH FOOT OF STRIPPING.

2. INSERT GLASS IN CHANNEL AND PRESS FIRMLY INTO PLACE. USE THE STRAIGHT END OF THE INSTALLATION TOOL TO ASSIST IN STUBBORN AREAS.


INSTALLATION AND REMOVAL TOOL
CAB PANEL
GLASS
CHANNEL STRIP
CHANNEL STRIP
INNER LIP
REMOVAL AND INSTALLATION TOOL

3. USING THE OFFSET END OF THE TOOL, LOCK THE CHANNEL STRIP IN PLACE

4. TO REMOVE GLASS, PLACE OFFSET END OF TOOL IN CHANNEL LOCK AND PULL OUT INNER LIP.



5. INSERT STRAIGHT END OF TOOL BETWEEN GLASS AND CHANNEL

6. PULL TOOL AROUND GLASS UNTIL GLASS IS FREE OF CHANNEL

MEC 3810-287-15/ 3-67

Figure 3-67. Glass, removal and installation.

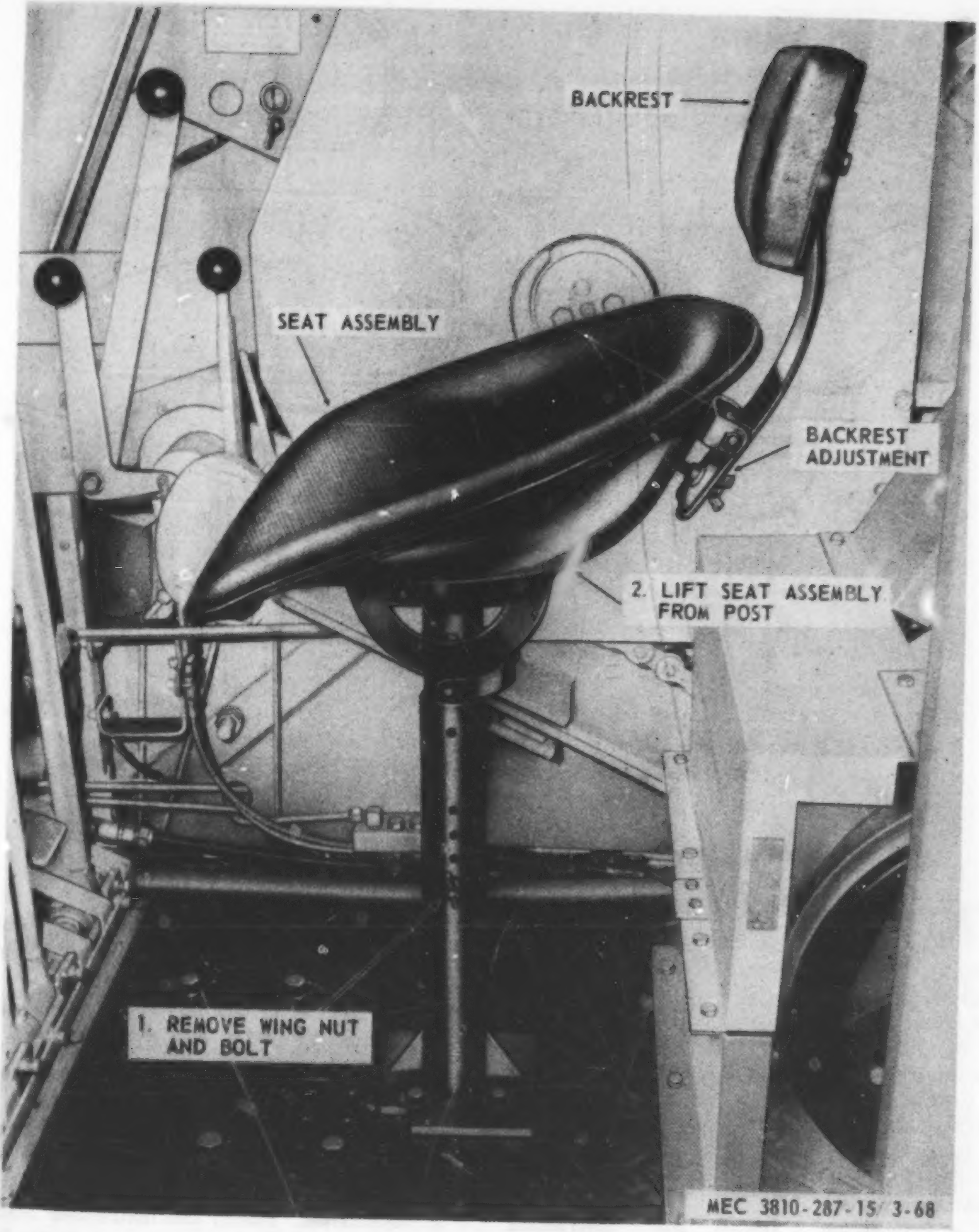

BACKREST
SEAT ASSEMBLY
BACKREST ADJUSTMENT
2. LIFT SEAT ASSEMBLY FROM POST
1. REMOVE WING NUT AND BOLT
MEC 3810-287-15/ 3-68

Figure 3-68. Seat assembly, removal and installation.

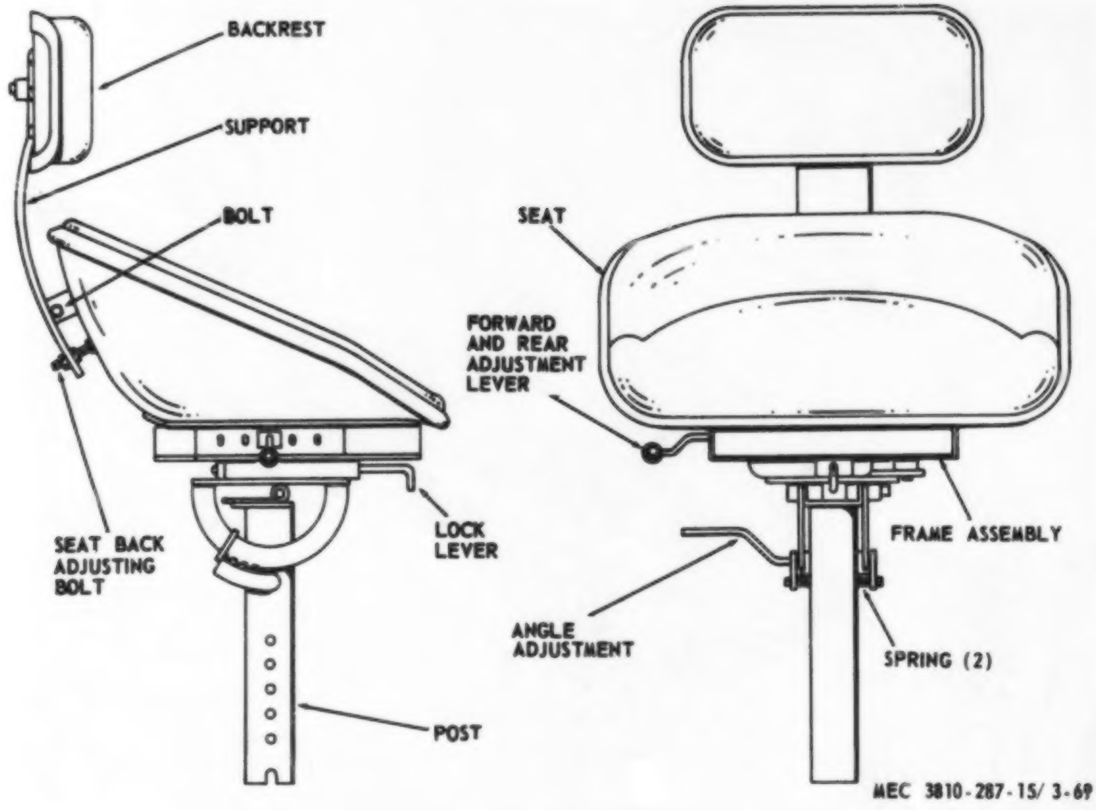

BACKREST
SUPPORT
BOLT
SEAT BACK ADJUSTING BOLT
LOCK LEVER
POST
SEAT
FORWARD AND REAR ADJUSTMENT LEVER
FRAME ASSEMBLY
ANGLE ADJUSTMENT
SPRING (2)
MEC 3810-287-15/ 3-69

Figure 3-69. Seat assembly, cross-sectional view.

Section XIV. BODY CHASSIS OR HULL ACCESSORY ITEMS

3-87. Instruction Plates

a. General. Instructions plates are places at various points on the machine to assist the operator in operation and maintenance of the machine.

b. Removal. Remove the instruction plates as instructed on figure 3-70.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for defects and damage. Replace defective or damaged parts.

e. Installation. Install the instruction plates in reverse of the instructions on figure 3-70.

3-88. Instruction Holders

a. General. Instruction holders are provided in the operator's compartment for the operation manual and lubrication chart.

b. Removal. Remove the instruction holders as instructed on figure 3-71.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for defects and damage. Replace defective or damaged parts.

e. Installation. Install the instruction holders in reverse of the instructions on figure 3-71.

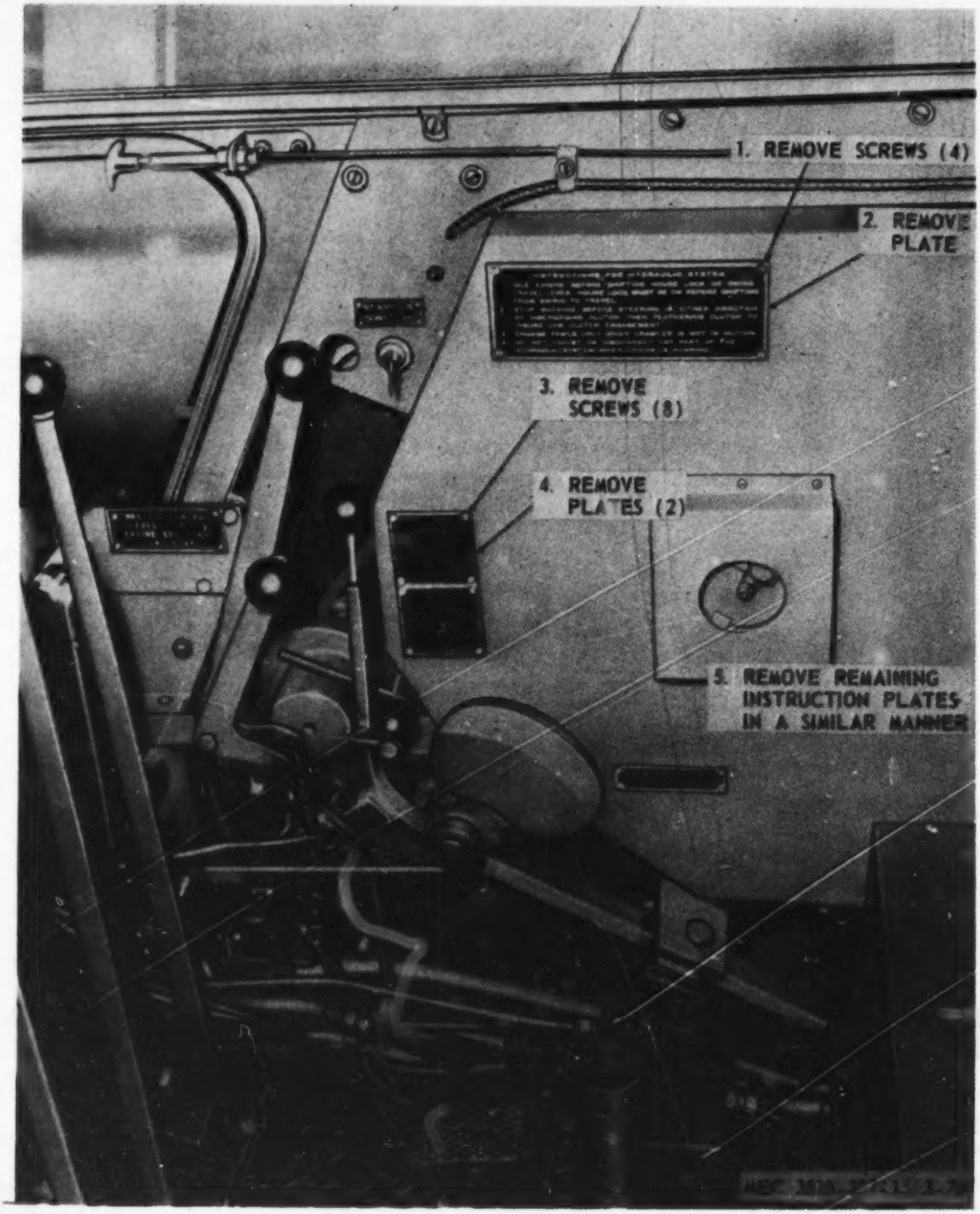

1. REMOVE SCREWS (4)
2. REMOVE PLATE
3. REMOVE SCREWS (8)
4. REMOVE PLATES (2)
5. REMOVE REMAINING INSTRUCTION PLATES IN A SIMILAR MANNER

Figure 3-70. Instruction plates, removal and installation.

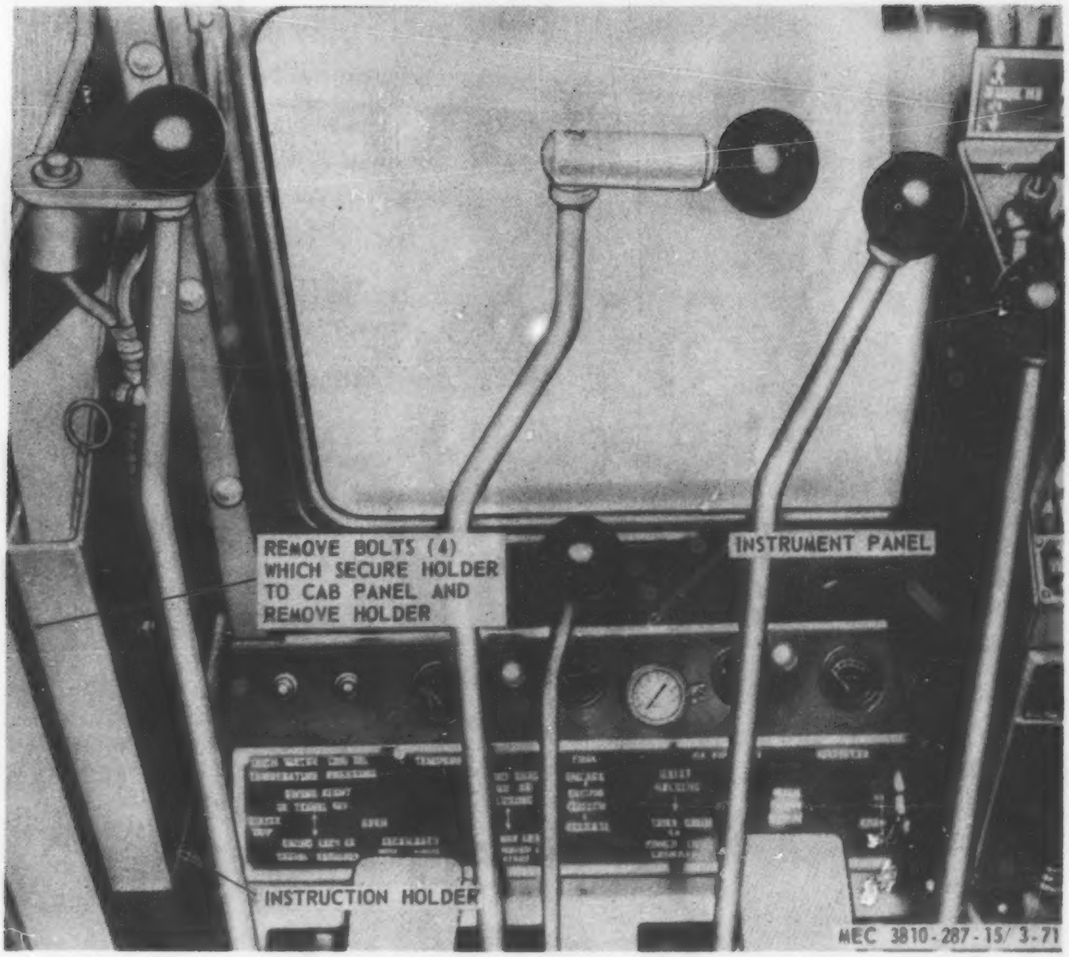

REMOVE BOLTS (4)
WHICH SECURE HOLDER
TO CAB PANEL AND
REMOVE HOLDER
INSTRUMENT PANEL
INSTRUCTION HOLDER
MEC 3810-287-15/3-71

Figure 3-71. Instruction holders, removal and installation.

Section XV. HYDRAULIC SYSTEM

3-89. Master Cylinders

a. General. Control of the L-36M crane-shovel is attained through the use of hydraulic master cylinders located at the lower end of the control levers. These cylinders, when actuated by the levers, activate slave cylinders in the clutch linkage, which, in turn, actuate the clutches.

b. Removal. Remove the master cylinders as instructed on figure 3-72.

c. Disassembly. Disassemble the master cylinder as instructed on figure 3-73.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for wear, defects, and damage. Replace worn, defective, or damaged parts.

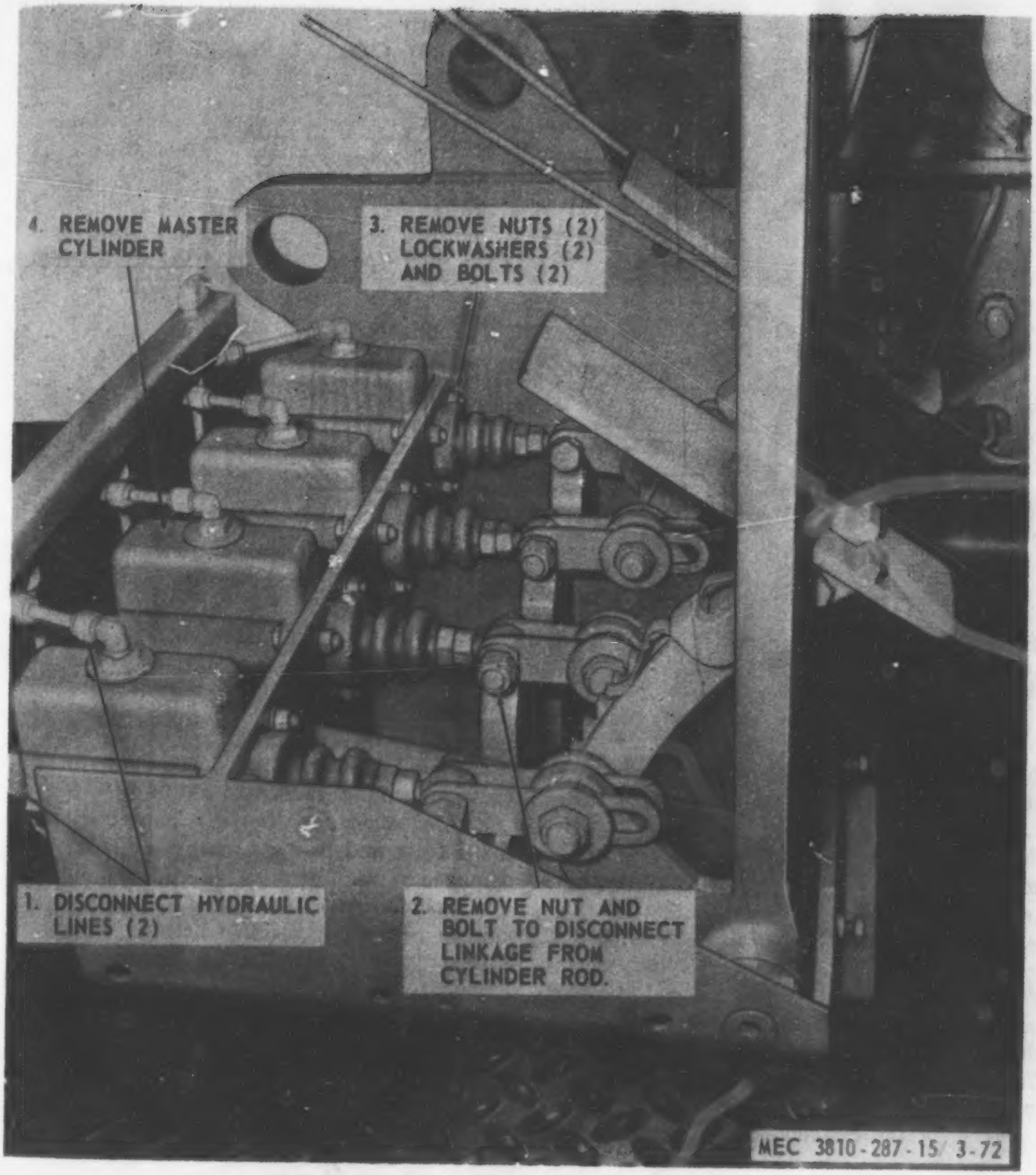

4. REMOVE MASTER CYLINDER
3. REMOVE NUTS (2) LOCKWASHERS (2) AND BOLTS (2)
1. DISCONNECT HYDRAULIC LINES (2)
2. REMOVE NUT AND BOLT TO DISCONNECT LINKAGE FROM CYLINDER ROD.
MEC 3810-287-15/ 3-72

Figure 3-72. Master cylinders, removal and installation.

f. Reassembly. Reassemble the master cylinders in reverse of the instructions on figure 3-73.

g. Installation. Install the master cylinders in reverse of the instructions on figure 3-72.

3-90. Slave Cylinders

a. General. The salve cylinders are located in the clutch actuating linkage, and operated by hydraulic pressure supplied by the master cylinders.

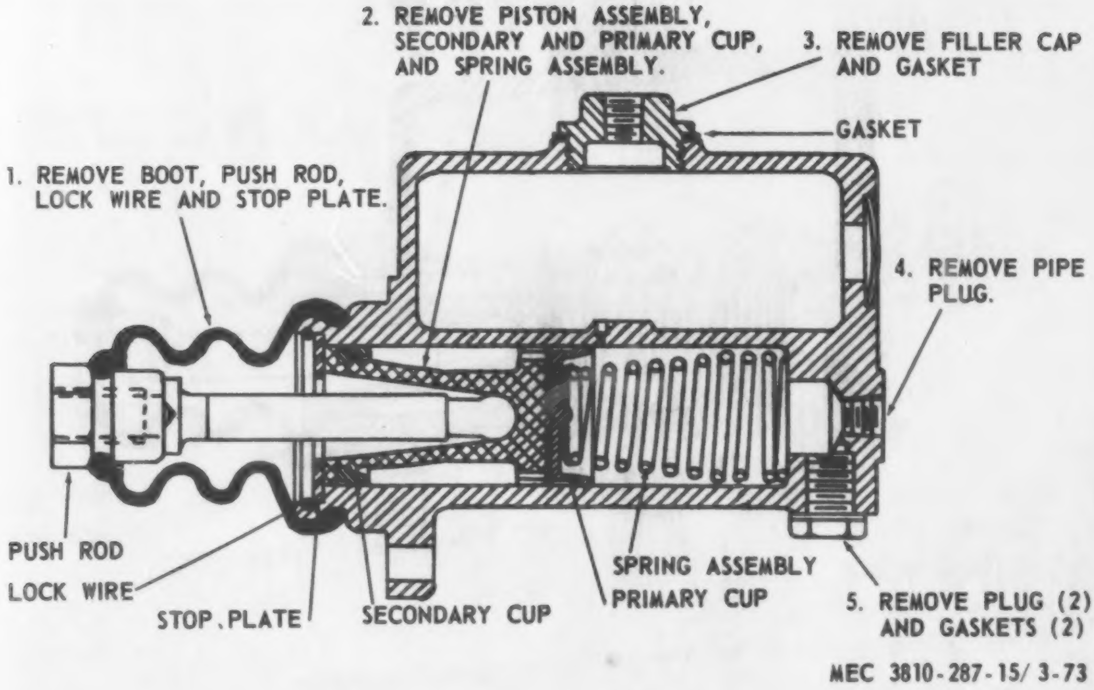

2. REMOVE PISTON ASSEMBLY, SECONDARY AND PRIMARY CUP, AND SPRING ASSEMBLY.
3. REMOVE FILLER CAP AND GASKET
GASKET
1. REMOVE BOOT, PUSH ROD, LOCK WIRE AND STOP PLATE.
4. REMOVE PIPE PLUG.
PUSH ROD
LOCK WIRE
STOP PLATE
SECONDARY CUP
SPRING ASSEMBLY
PRIMARY CUP
5. REMOVE PLUG (2) AND GASKETS (2)
MEC 3810-287-15/3-73

Figure 3-73. Master cylinder, cross-sectional view.

b. Removal. Remove the slave cylinders as instructed on figure 3-74.

c. Disassembly. Disassemble the slave cylinders as instructed on figure 3-75.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for wear, defects, and damage. Replace worn, defective, or damaged parts.

f. Reassembly. Reassemble the slave cylinders in reverse of the instructions on figure 3-75.

g. Installation. Install the slave cylinders in reverse of the instructions on figure 3-74.

3-91. Hydraulic Reservoir (controls)

a. General. The hydraulic reservoir for the turntable controls is mounted on the cab side panel to the right rear of the operator's compartment.

b. Removal. Remove the hydraulic reservoir as instructed on figure 3-76.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for defects and damage. Replace defective or damaged parts.

e. Installation. Install the hydraulic reservoir in reverse of the instructions on figure 3-76.

3-92. Hydraulic Lines and Fittings (controls)

a. General. The hydraulic lines and fittings extend from the master cylinders, at the operator's station to the slave cylinders at the clutch shaft, and from the hydraulic reservoir to the master cylinders.

b. Removal. Remove the hydraulic lines and fittings as instructed on figure 3-77.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for defects and damage. Replace defective or damaged parts.

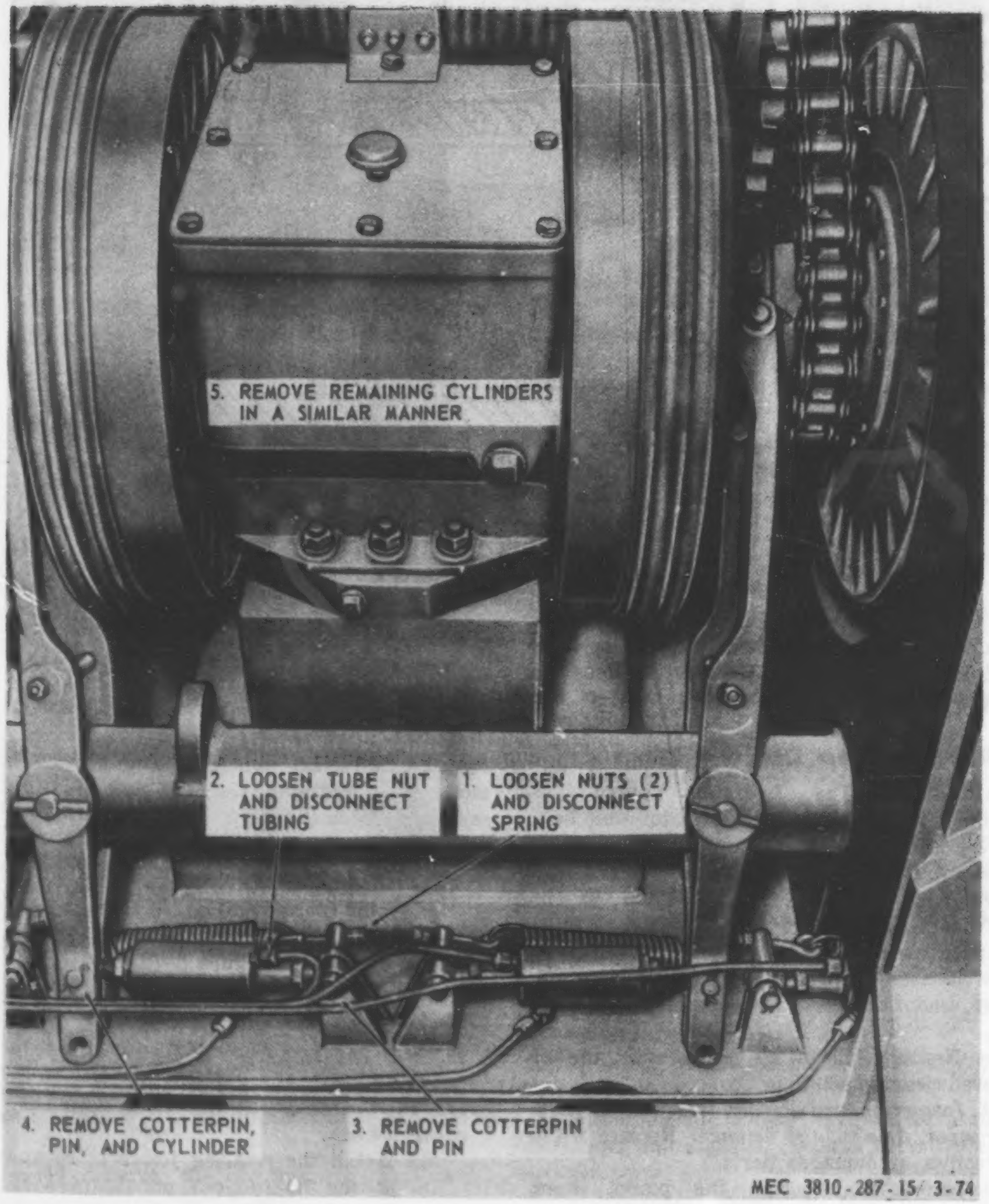

5. REMOVE REMAINING CYLINDERS IN A SIMILAR MANNER
2. LOOSEN TUBE NUT AND DISCONNECT TUBING
1. LOOSEN NUTS (2) AND DISCONNECT SPRING
4. REMOVE COTTERPIN, PIN, AND CYLINDER
3. REMOVE COTTERPIN AND PIN
MEC 3810-287-15/3-74

Figure 3-74. Slave cylinders, removal and installation.

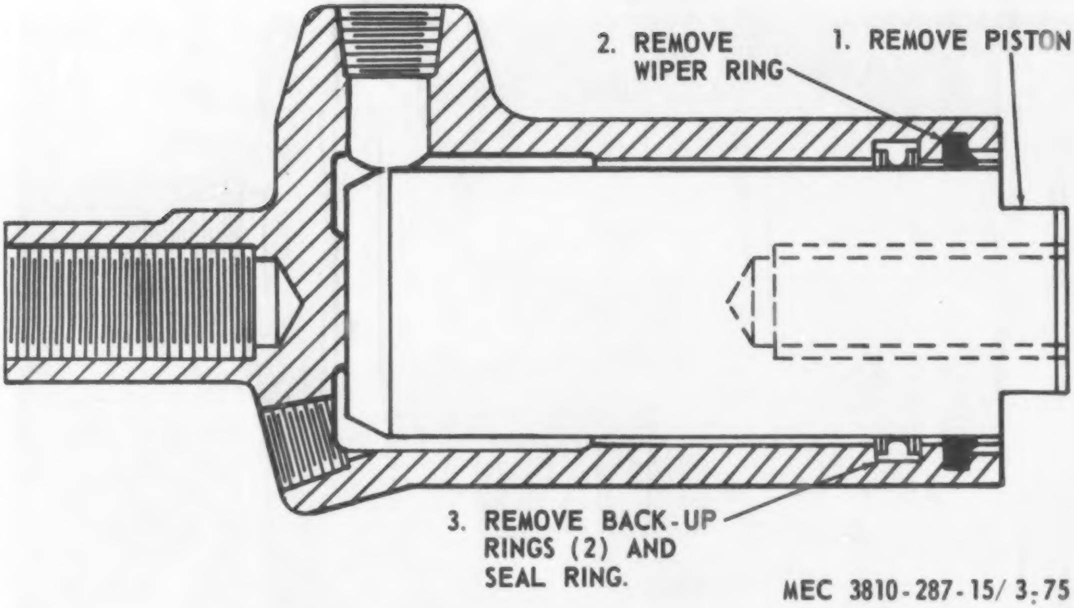


Figure 3-75. Slave cylinders, cross-sectional view.

e. Installation. Install the hydraulic lines and fittings in reverse of the instructions on figure 3-77.

3-93. Pump, Hose, Lines and Fittings

a. General. The hydraulic pump is mounted under the engine radiator and belt-driven from the engine crankshaft. It supplies oil from the hydraulic reservoir to the bevel gear case for lubrication and to the crawler control valve for operation of the crawler jaw clutches.

b. Removal. Remove the hydraulic pump, lines, and fittings as instructed on figure 3-78.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects, and damage. Replace worn, defective, or damaged parts.

e. Installation. Install the pump, hose, lines, and fittings in reverse of the instructions on figure 3-78.

3-94. Rotating Joints

a. General. The rotating joints are located at the outer ends of the power load lowering shaft and power boom lowering shaft. They are free-revolving joints which provide a method for hydraulic fluid to flow into the shaft and clutch assembly.

b. Removal.

(1) Disconnect the hydraulic lines to the joint (para 3-90).

(2) Remove the rotating joints as instructed on figure 3-79.

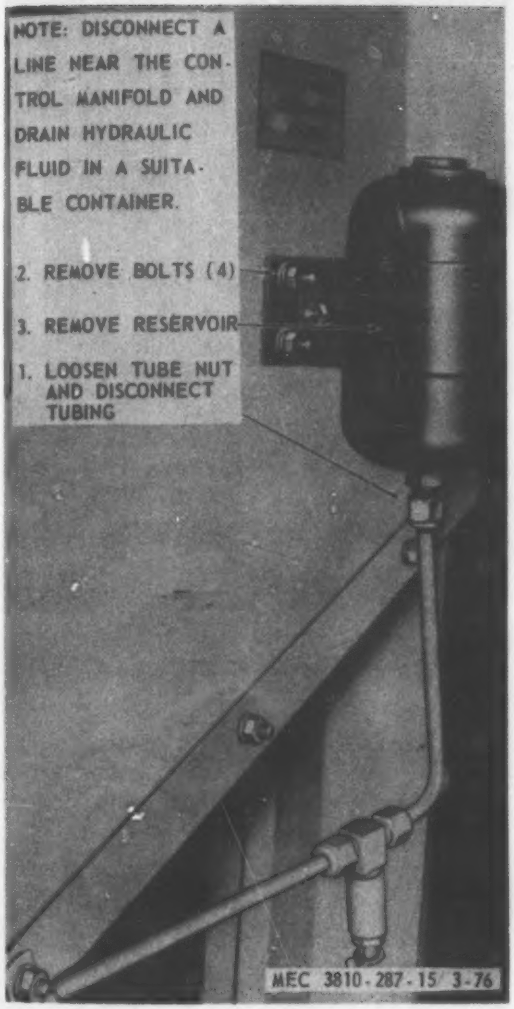
c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects, and damage. Replace worn, defective or damaged parts.

e. Installation.

(1) Install the rotating joints in reverse of the instructions on figure 3-79.

(2) Install the hydraulic lines (para 3-90).



NOTE: DISCONNECT A LINE NEAR THE CONTROL MANIFOLD AND DRAIN HYDRAULIC FLUID IN A SUITABLE CONTAINER.

2. REMOVE BOLTS (4)

3. REMOVE RESERVOIR

1. LOOSEN TUBE NUT AND DISCONNECT TUBING

Figure 3-76. Hydraulic reservoir, removal and installation.

3-95. Control Valve (crawler)

a. General. The crawler control valve is located on the right of the operator's compartment and controls the operation of the crawler jaw clutches.

b. Removal.

(1) Remove the hydraulic lines and fittings (para 3-90).

(2) Remove the control valve as instructed on figure 3-80.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects, leakage, and damage. Replace a worn, defective, leaking or damaged valve.

e. Installation.

(1) Install the control valve in reverse of the instructions on figure 3-80.

(2) Install the hydraulic lines and fittings (para 3-90).

3-96. House Lock Cylinder

a. General. The house lock cylinder is located on the right hand machinery side frame and shifts the jaw clutches for locking the superstructure to the crawler for travel.

b. Removal. Remove the house lock cylinder as instructed on figure 3-81.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects, leakage and damage. Replace worn, defective, leaking or damaged parts.

e. Installation. Install the house lock cylinder in reverse of the instructions on figure 3-81.

3-97. Hydraulic Reservoir (main)

a. General. The main hydraulic reservoir is attached under the turntable bed and located at the right rear corner. It supplies oil to the pump for lubrication of the bevel gear housing, and operation of the crawler hydraulic controls.

b. Cap, Strainer, and Dipstick Removal. Remove the cap, strainer, and dipstick as instructed on figure 3-82.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for defects and damage. Replace defective or damaged parts.

e. Installation. Install the reservoir, cap, strainer, and dipstick as instructed on figure 3-82.

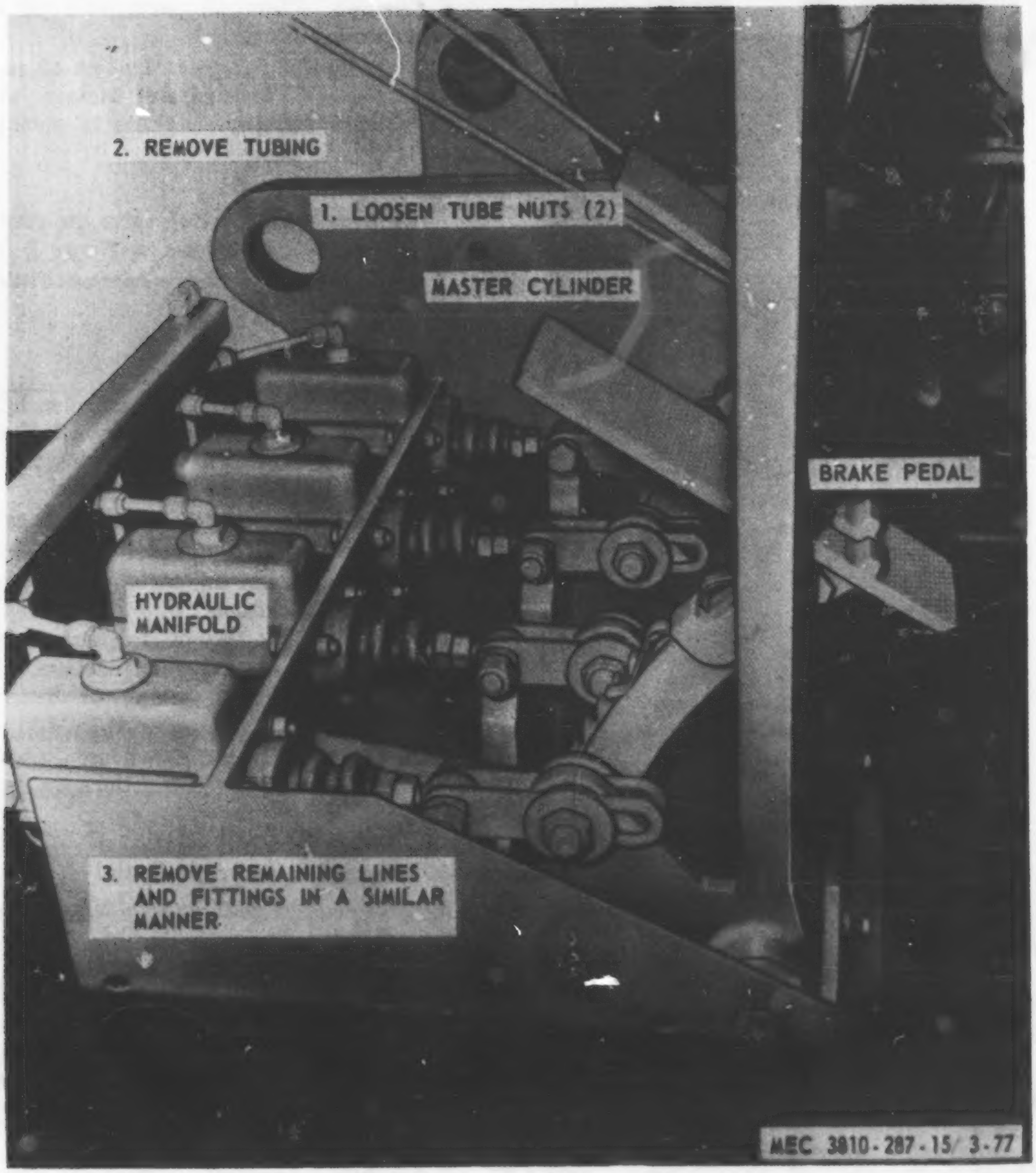

2. REMOVE TUBING
1. LOOSEN TUBE NUTS (2)
MASTER CYLINDER
BRAKE PEDAL
HYDRAULIC MANIFOLD
3. REMOVE REMAINING LINES AND FITTINGS IN A SIMILAR MANNER
MEC 3810-287-15/3-77

Figure 3-77. Hydraulic lines and fittings, removal and installation.

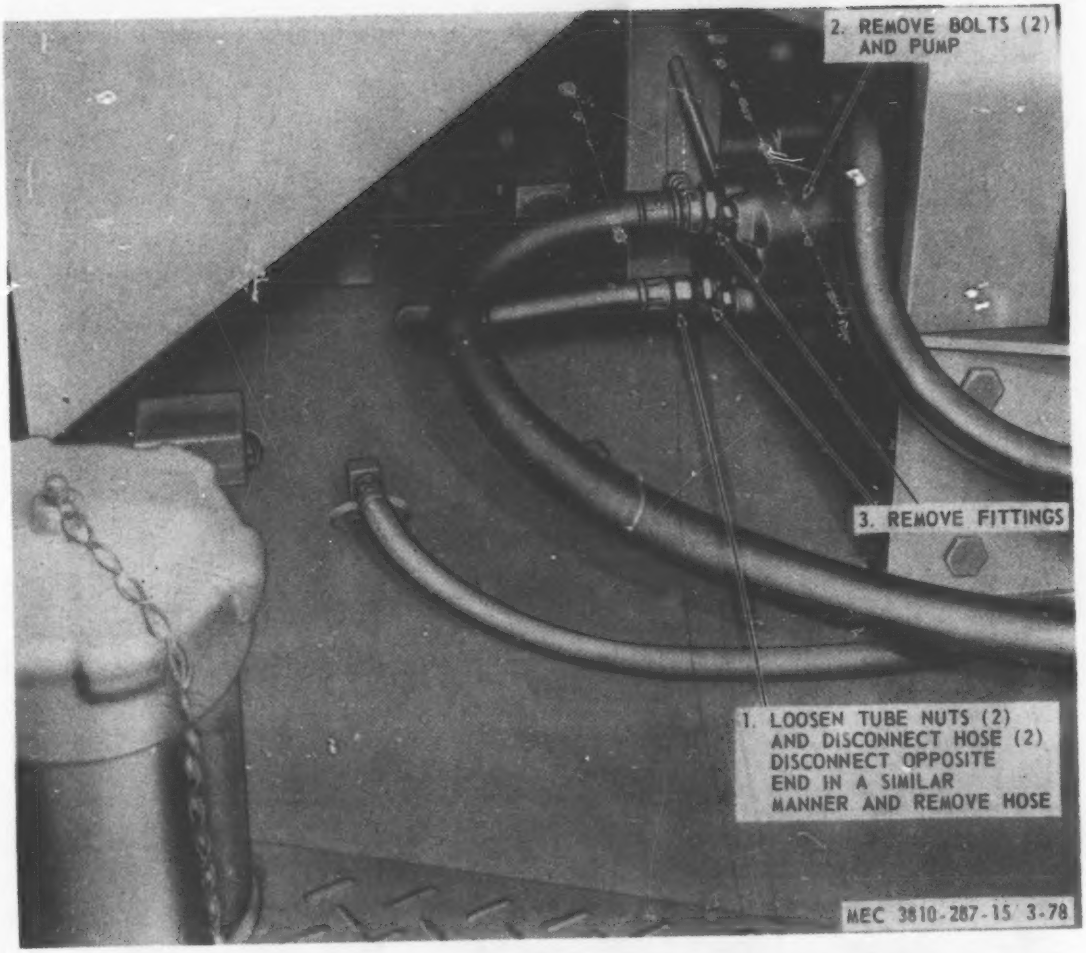

2. REMOVE BOLTS (2) AND PUMP
3. REMOVE FITTINGS
1. LOOSEN TUBE NUTS (2) AND DISCONNECT HOSE (2) DISCONNECT OPPOSITE END IN A SIMILAR MANNER AND REMOVE HOSE
MEC 3810-287-15 3-78

Figure 3-78. Pump, hose, lines, and fittings, removal and installation.

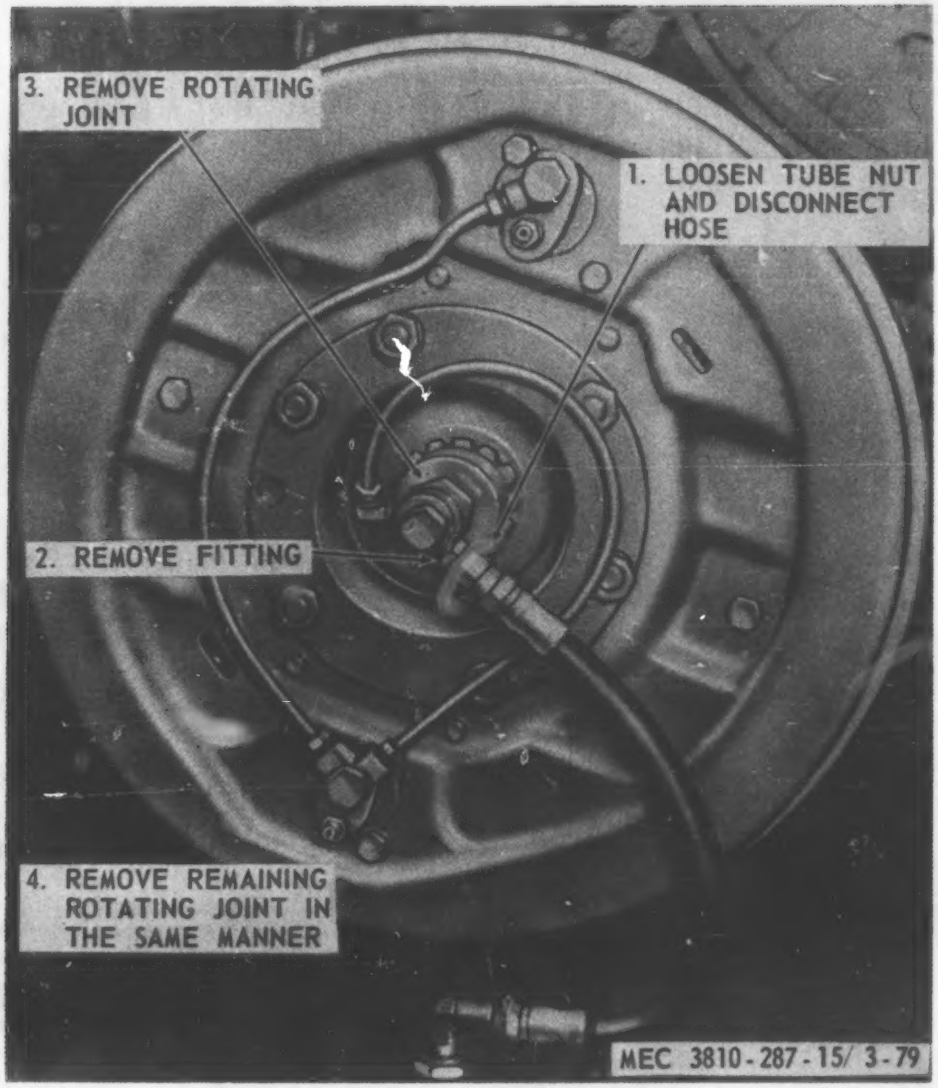

3. REMOVE ROTATING JOINT
1. LOOSEN TUBE NUT AND DISCONNECT HOSE
2. REMOVE FITTING
4. REMOVE REMAINING ROTATING JOINT IN THE SAME MANNER
MEC 3810-287-15/ 3-79

Figure 3-79. Rotating joints, removal and installation.

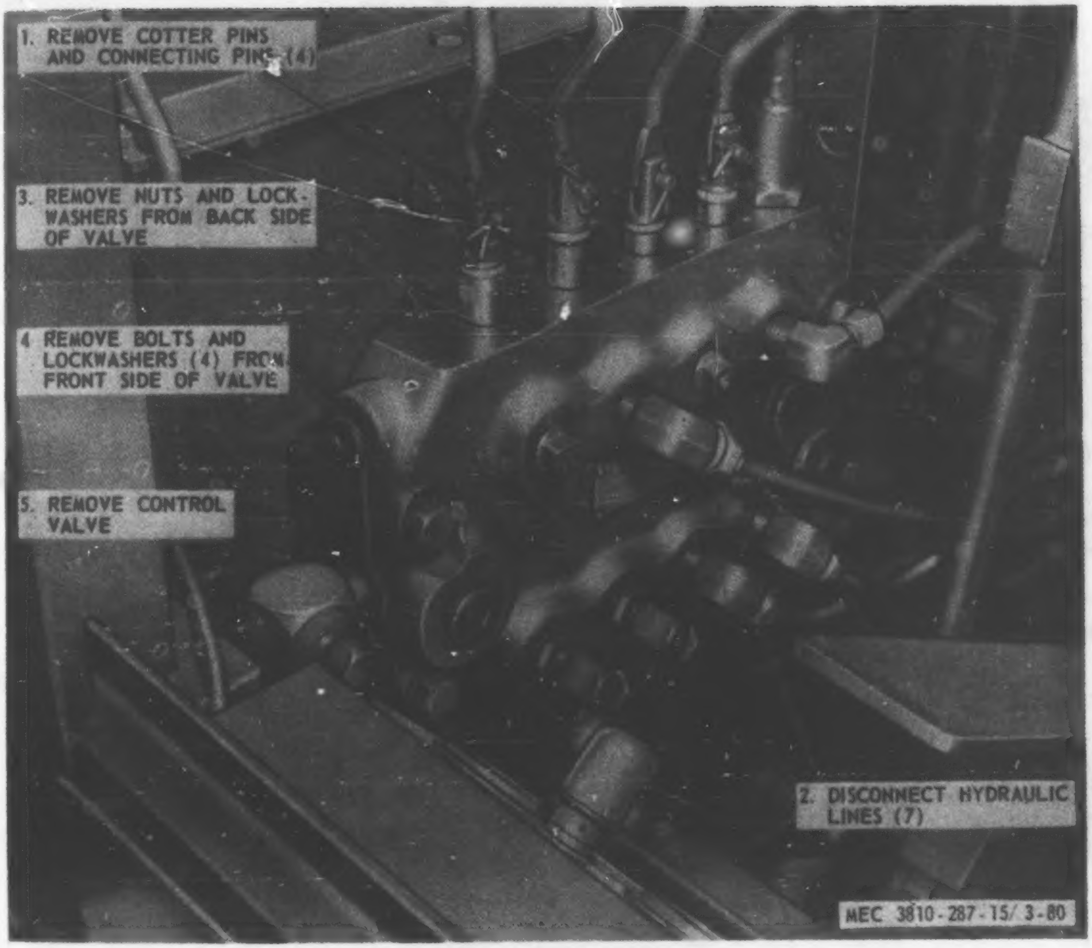

1. REMOVE COTTER PINS AND CONNECTING PINS (4)
3. REMOVE NUTS AND LOCK-WASHERS FROM BACK SIDE OF VALVE
4 REMOVE BOLTS AND LOCKWASHERS (4) FROM FRONT SIDE OF VALVE
5. REMOVE CONTROL VALVE
2. DISCONNECT HYDRAULIC LINES (7)
MEC 3810-287-15/3-80

Figure 3-80. Control valve, removal and installation.

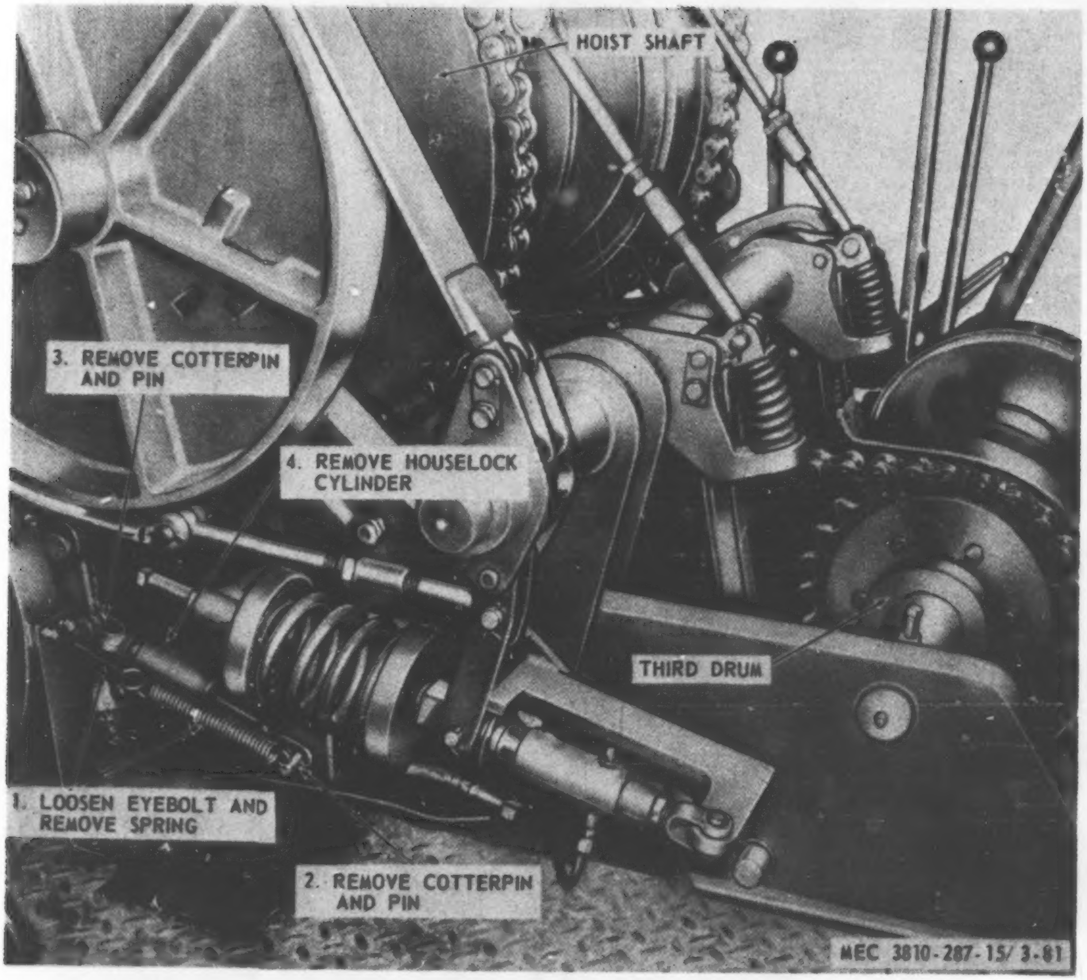
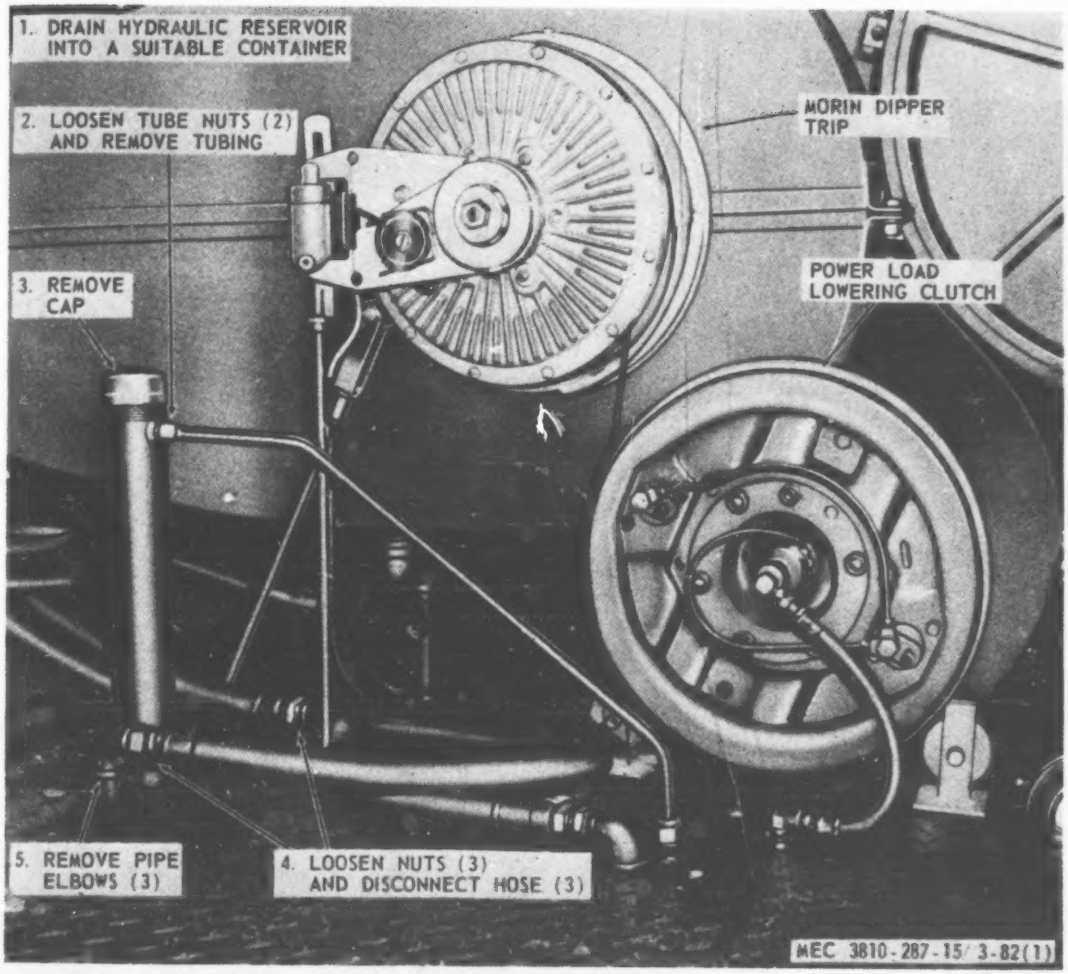
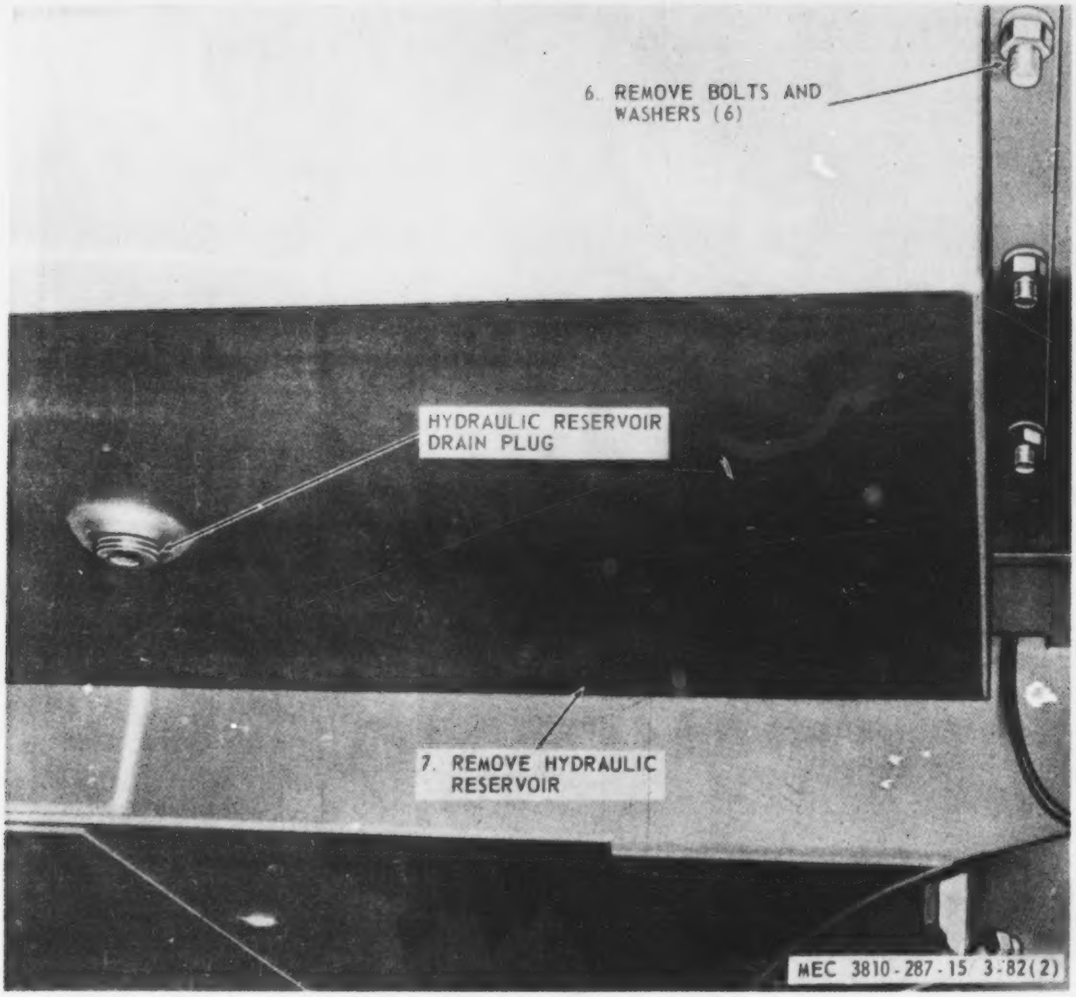

HOIST SHAFT
3. REMOVE COTTERPIN AND PIN
4. REMOVE HOUSELOCK CYLINDER
THIRD DRUM
1. LOOSEN EYEBOLT AND REMOVE SPRING
2. REMOVE COTTERPIN AND PIN
MEC 3810-287-15/ 3-81

Figure 3-81. House lock cylinder, removal and installation.


1. DRAIN HYDRAULIC RESERVOIR INTO A SUITABLE CONTAINER
2. LOOSEN TUBE NUTS (2) AND REMOVE TUBING
3. REMOVE CAP
MORIN DIPPER TRIP
POWER LOAD LOWERING CLUTCH
5. REMOVE PIPE ELBOWS (3)
4. LOOSEN NUTS (3) AND DISCONNECT HOSE (3)
MEC 3810-287-15/3-82(1)

A. HOSE, CAP, STRAINER AND DIPSTICK

Figure 3–82 (1). Hydraulic reservoir, cap, strainer, and dipstick, removal and installation.


6. REMOVE BOLTS AND WASHERS (6)
HYDRAULIC RESERVOIR DRAIN PLUG
7. REMOVE HYDRAULIC RESERVOIR
MEC 3810-287-15 3-82(2)

B. HYDRAULIC RESERVOIR
Figure 3-82 (2).—Continued.

Section XVI. CLUTCHES

3–98. Clutch Shaft Clutches

a. General. The L–36M employs a clutch shaft design which incorporates all the major clutches on one shaft. The two swing clutches, right and left hoist clutches, and the boom hoist clutch are combined on this shaft to make up the clutch shaft assembly.

b. Removal. Remove the clutch shoe assemblies as instructed on figure 3–83.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective, or damaged parts.

e. Installation. Install the clutch shoe assemblies in reverse of the instructions on figure 3–83.

f. Adjustment. Refer to paragraph 3–13 and adjust the clutches.

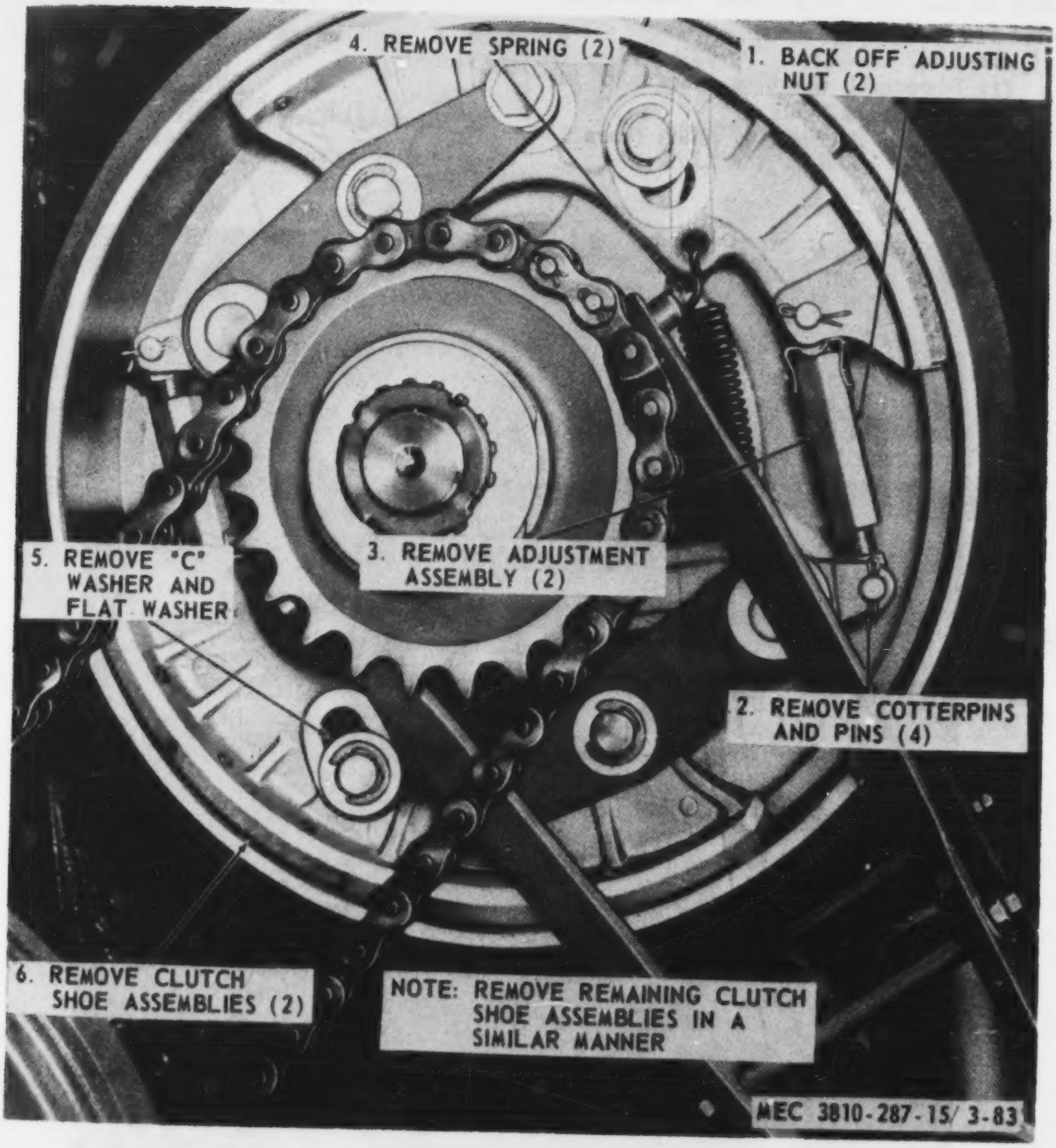

4. REMOVE SPRING (2)
1. BACK OFF ADJUSTING NUT (2)
5. REMOVE "C" WASHER AND FLAT WASHER
3. REMOVE ADJUSTMENT ASSEMBLY (2)
2. REMOVE COTTERPINS AND PINS (4)
6. REMOVE CLUTCH SHOE ASSEMBLIES (2)
NOTE: REMOVE REMAINING CLUTCH SHOE ASSEMBLIES IN A SIMILAR MANNER
MEC 3810-287-15/ 3-83

Figure 3-83. Hoist, swing, and hoist clutch shoes, removal and installation

3-99. Power Load Lowering and Power Boom Lowering Clutches

a. General. The power load lowering and power boom lowering clutches are located on the right and left wing plates of the turntable bed. The power load lowering clutch, located on the right wing plate, provides engagement with the machinery for powering down the

best copy available

Reproduced from poor document.

load. The power boom lowering clutch, located on the left wing plate, provides the same function for the boom.

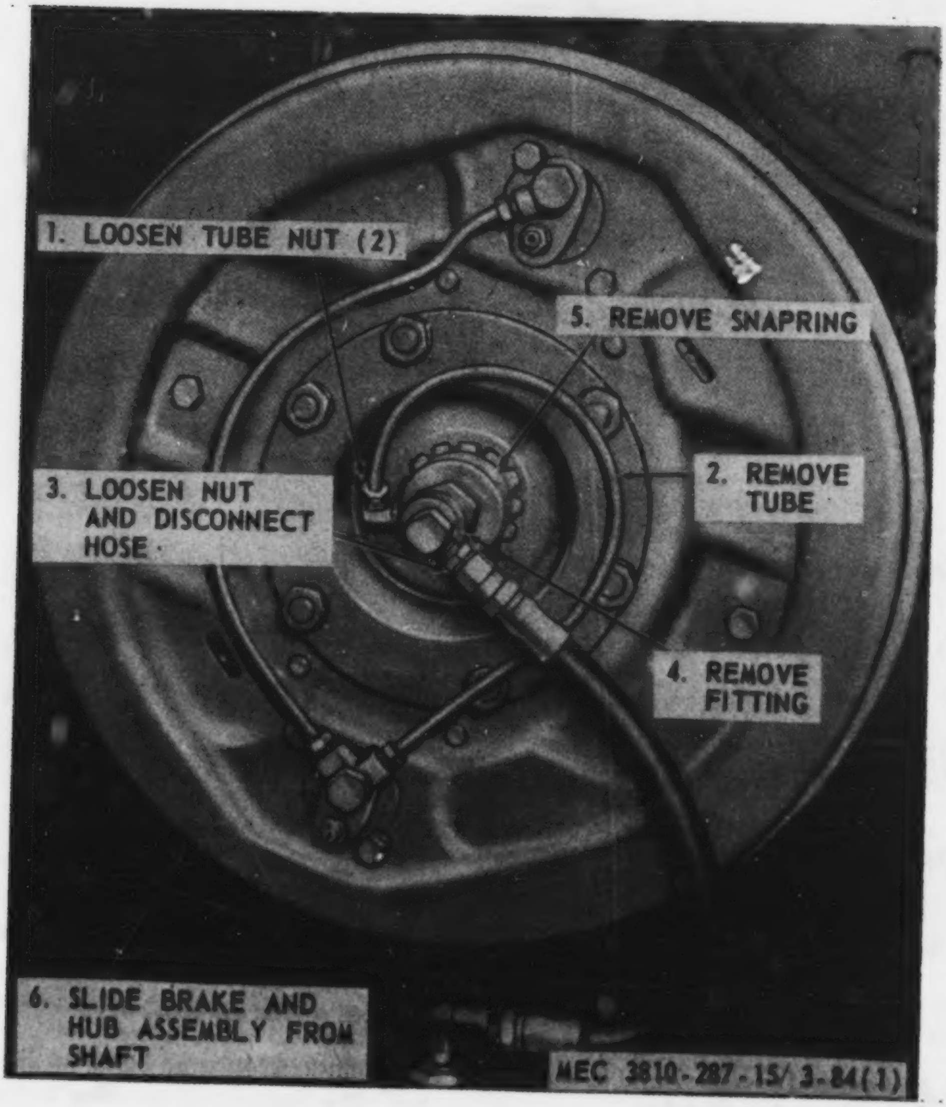
b. Removal.

(1) Disconnect the hose, lines and fittings (para 3-90).

(2) Remove the rotating joints (para 3-92).

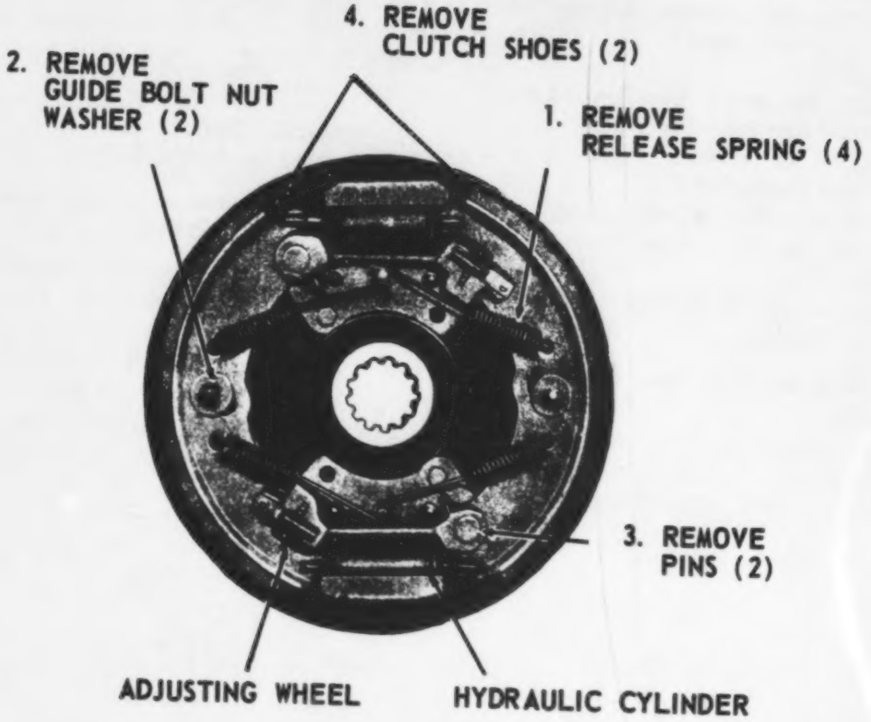
(3) Remove the power load lowering and power boom lowering clutch shoe assemblies as instructed on figure 3-84.

c. Cleaning. Clean all parts with an approved cleaning solution.


1. LOOSEN TUBE NUT (2)
5. REMOVE SNAPRING
2. REMOVE TUBE
3. LOOSEN NUT AND DISCONNECT HOSE
4. REMOVE FITTING
6. SLIDE BRAKE AND HUB ASSEMBLY FROM SHAFT
MEC 3810-287-15/3-84(1)

A. HUB ASSEMBLY

Figure 3-84. (1). Power load lowering and power boom lowering clutch shoe assemblies, removal and installation.


4. REMOVE CLUTCH SHOES (2)
2. REMOVE GUIDE BOLT NUT WASHER (2)
1. REMOVE RELEASE SPRING (4)
3. REMOVE PINS (2)
ADJUSTING WHEEL
HYDRAULIC CYLINDER

B. SHOE ASSEMBLIES

MEC 3810-287-15/3-84(2)

Figure 3-84 (2).—Continued.

d. Inspection and Repair. Inspect all parts for wear, defects, and damage. Replace worn, defective, or damaged parts.

e. Installation.

(1) Install the power load lowering and power boom lowering clutch shoe assemblies in reverse of the instructions on figure 3-84.

(2) Install the rotating joints (para 3-92).

(3) Install the hose, lines, and fittings (para 3-90).

f. Adjustment. Refer to paragraph 3-14 and adjust the clutches.

3-100. Hoist, Boom Hoist, and Third Drum Brakes

a. General. The hoise shaft used on the L-36M contains a right-hand and left-hand hoist brake, in addition to a boom-hoist brake which is located at the right-hand end of the hoist shaft. The third drum brake band is located on the left end of the third drum assemblies and actuated by a pedal from the operator's compartment.

b. Removal. Remove the brake assemblies as instructed on figure 3-85.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

e. Installation. Install the hoist, boom-hoist and third drum brake assemblies in reverse of the instructions on figure 3-85.

f. Adjustment. Refer to paragraph 3-15 and adjust the brakes.

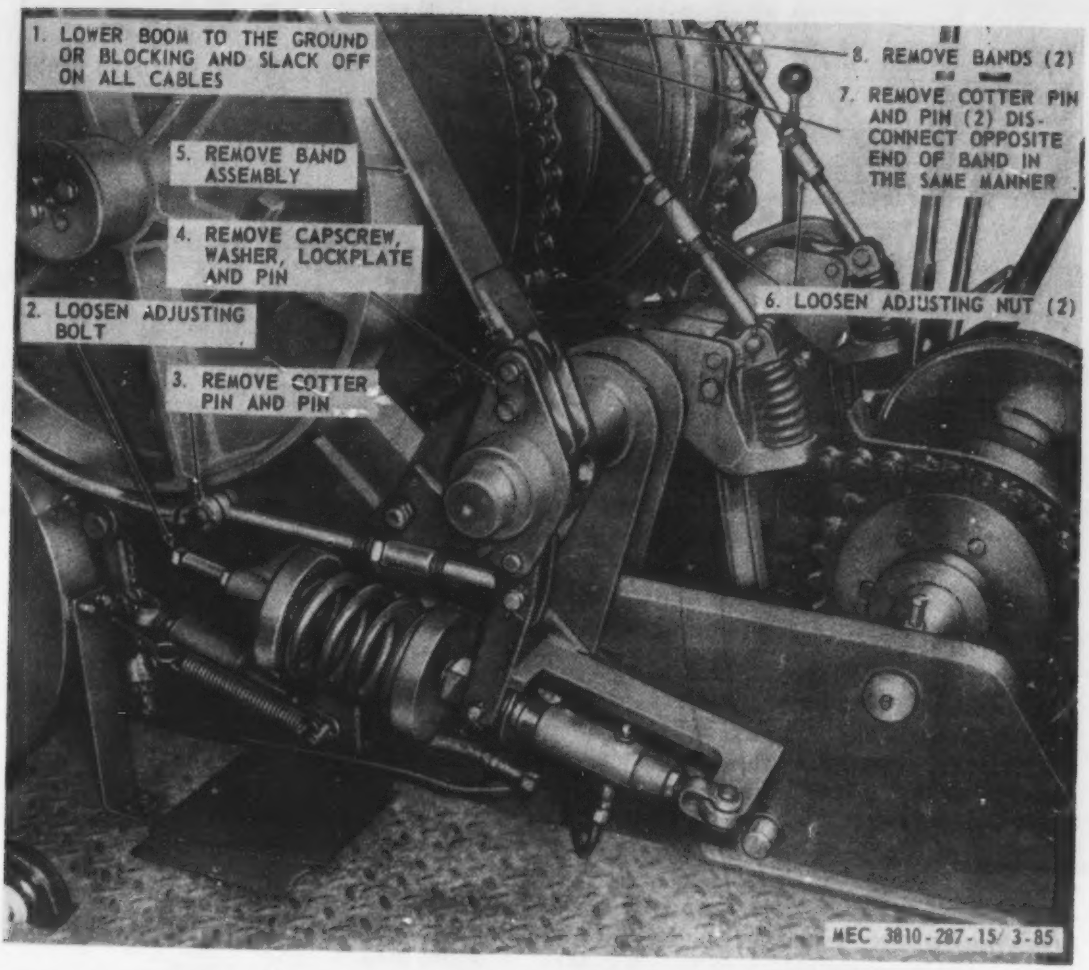

1. LOWER BOOM TO THE GROUND OR BLOCKING AND SLACK OFF ON ALL CABLES
8. REMOVE BANDS (2)
7. REMOVE COTTER PIN AND PIN (2) DISCONNECT OPPOSITE END OF BAND IN THE SAME MANNER
5. REMOVE BAND ASSEMBLY
4. REMOVE CAPSCREW, WASHER, LOCKPLATE AND PIN
6. LOOSEN ADJUSTING NUT (2)
2. LOOSEN ADJUSTING BOLT
3. REMOVE COTTER PIN AND PIN
MEC 3810-287-15/3-85

Figure 3-85. Hoist, boom-hoist and third drum brake, removal and installation.

Section XVII. CRANE BOOM SHEAVES, BRIDLE ASSEMBLY, HOOK BLOCK AND SAFETY BOOM STOPS

3-101. Crane Boom Sheaves

a. General. The crane boom sheaves are located at the peak of the boom and supported by a removable shaft. The sheaves guide the hoist cables over the point of boom to the hook block or load.

b. Removal. Remove the crane boom sheaves as instructed on figure 3-86.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair.

(1) Inspect the sheaves for damage, worn cable groove and worn or damaged bushing. Replace a worn or damaged sheave.

(2) Inspect the shaft and related parts for wear, defects and damaged parts.

e. Installation. Install the crane boom sheaves in reverse of the instructions on figure 3-86.

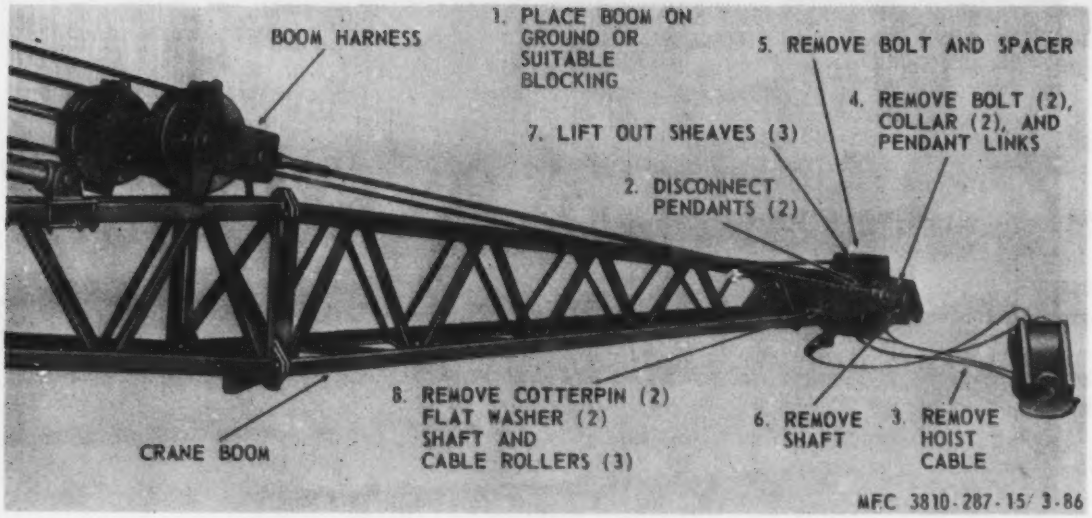

BOOM HARNESS
1. PLACE BOOM ON GROUND OR SUITABLE BLOCKING
5. REMOVE BOLT AND SPACER
4. REMOVE BOLT (2), COLLAR (2), AND PENDANT LINKS
7. LIFT OUT SHEAVES (3)
2. DISCONNECT PENDANTS (2)
8. REMOVE COTTERPIN (2) FLAT WASHER (2) SHAFT AND CABLE ROLLERS (3)
6. REMOVE SHAFT
3. REMOVE HOIST CABLE
CRANE BOOM
MEC 3810-287-15/3-86

Figure 3-86 .Crane boom sheaves, removal and installation.

3-102. Boom Harness Assembly

a. General. The boom harness assembly is located between the A-frame and the boom point. It is attached to the boom point by pendant cables and the boom hoist by the boom hoist cables.

b. Removal. Remove the boom harness assembly (para 2-6).

c. Disassembly. Disassemble the boom harness assembly as instructed on figure 3-87.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair.

(1) Inspect all parts for wear, defects, and damage. Replace worn, defective, or damaged parts.

(2) Inspect the sheaves for worn cable grooves and worn or damaged bushings. Replace worn sheaves.

f. Reassembly. Reassemble the boom harness assembly in reverse of the instructions on figure 3-87.

g. Installation. Install the boom harness assembly (para 2-6).

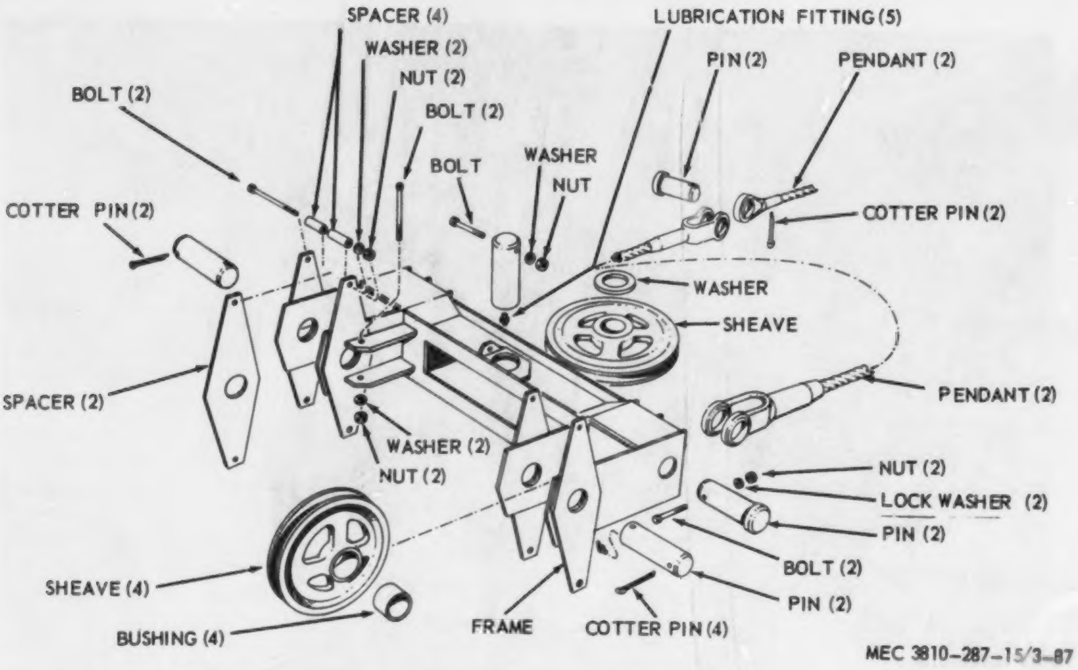

SPACER (4)
WASHER (2)
NUT (2)
BOLT (2)
BOLT (2)
BOLT
WASHER
NUT
LUBRICATION FITTING (5)
PIN (2)
PENDANT (2)
COTTER PIN (2)
COTTER PIN (2)
WASHER
SHEAVE
SPACER (2)
PENDANT (2)
WASHER (2)
NUT (2)
NUT (2)
LOCK WASHER (2)
PIN (2)
BOLT (2)
SHEAVE (4)
PIN (2)
BUSHING (4)
FRAME
COTTER PIN (4)
MEC 3810-287-15/3-87

Figure 3-87. Boom harness assembly, exploded view.

Section XVIII. DRIVE CHAINS, GUARDS AND SHIELDS

3-103. Drive Chains

a. General. The hoist and boom hoist drive chains extend from the clutch shaft sprockets to the hoist and boom hoist drum sprockets. They are of roller chain design with a master link for quick removal.

b. Removal. Remove the hoist and boom hoist drive chains as instructed on figure 3-88.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects, and damage. Replace worn, defective, or damaged parts. Inspect the chain for broken rollers, pins, and side bars. Replace a broken or damaged chain.

e. Installation. Install the hoist and boom hoist drive chains in reverse of the instructions on figure 3-88.

f. Adjustment. Refer to figure 3-88 and adjust the drive chains.

3-104. Guards and Shields

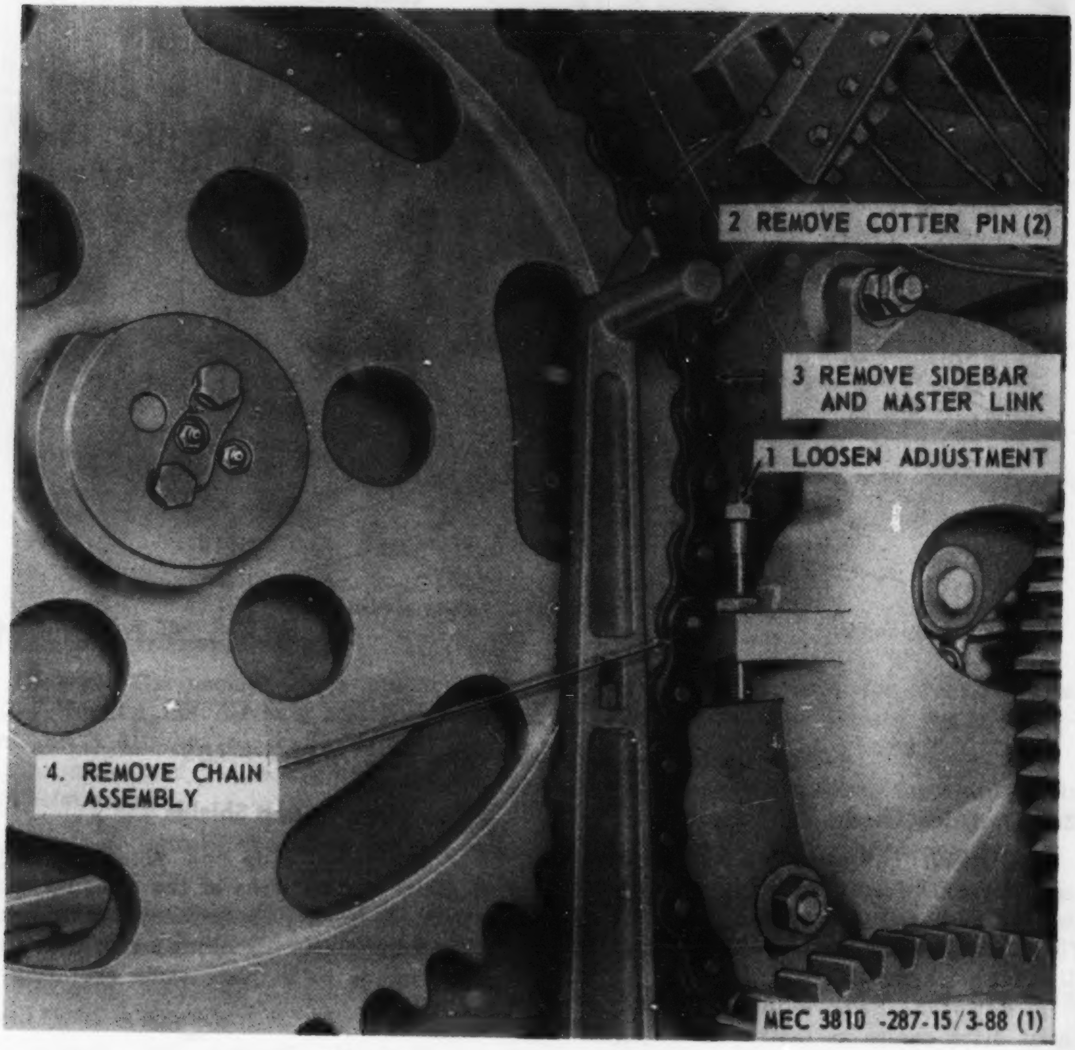
a. General. Guards and shields are provided in various areas of the machine to protect the operator from accidently being injured by moving parts. These guards and shields must always be in place when operating the machine.

b. Removal. Remove the guards and shields as instructed on figure 3-89.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for rust, dents, and other damage. Remove rust and straighten dents. Replace a badly damaged guard or shield.

e. Installation. Install the guards and shields in reverse of the instructions on figure 3-89.


2 REMOVE COTTER PIN (2)
3 REMOVE SIDEBAR AND MASTER LINK
1 LOOSEN ADJUSTMENT
4. REMOVE CHAIN ASSEMBLY
MEC 3810 -287-15/3-88 (1)

A. DRIVE CHAIN REMOVAL

Figure 3-88 (1). Hoist and boom hoist drive chains, removal, installation and adjustment.

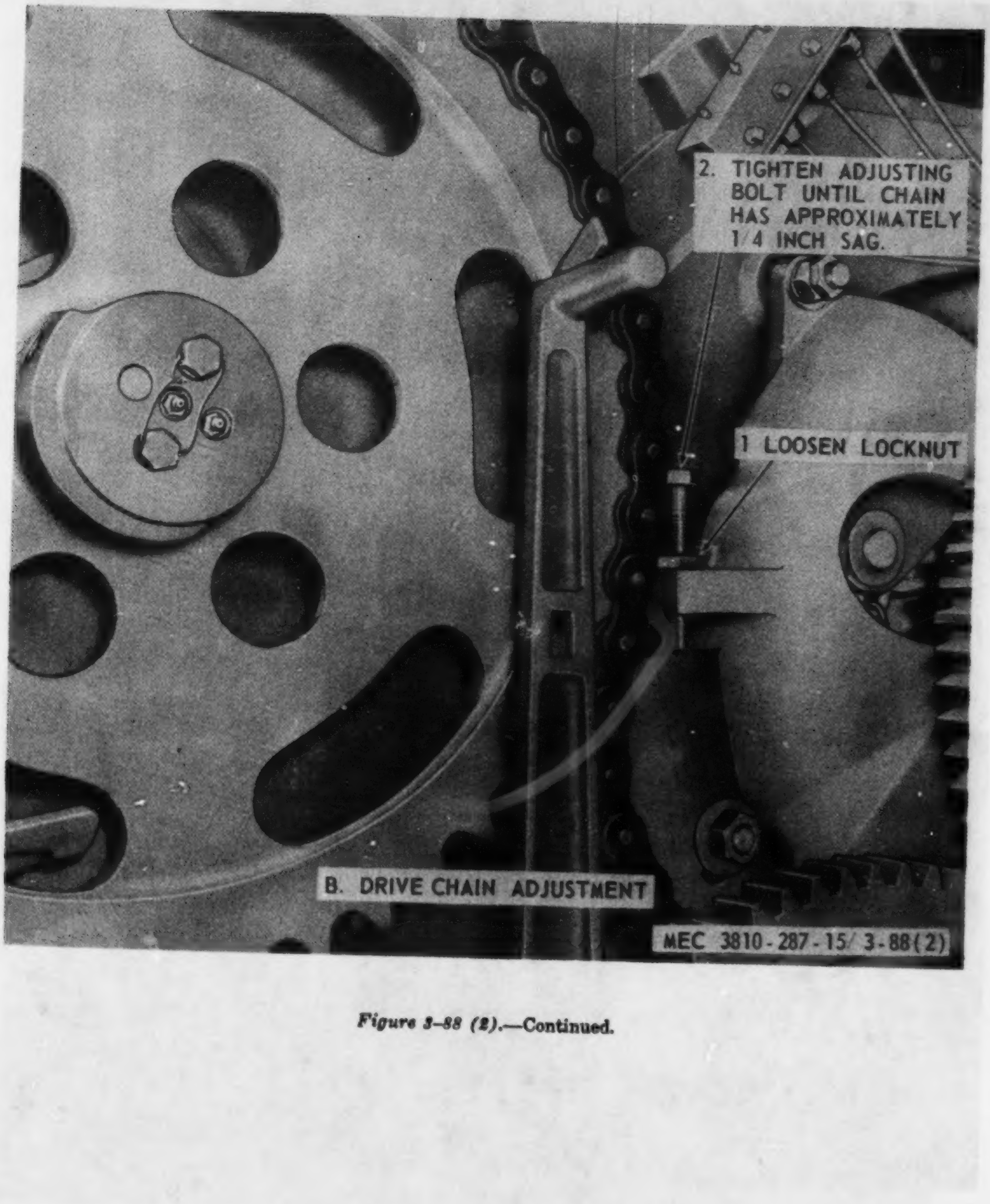

2. TIGHTEN ADJUSTING BOLT UNTIL CHAIN HAS APPROXIMATELY 1/4 INCH SAG.
1 LOOSEN LOCKNUT
B. DRIVE CHAIN ADJUSTMENT
MEC 3810-287-15/3-88(2)

Figure 3-88 (2).—Continued.

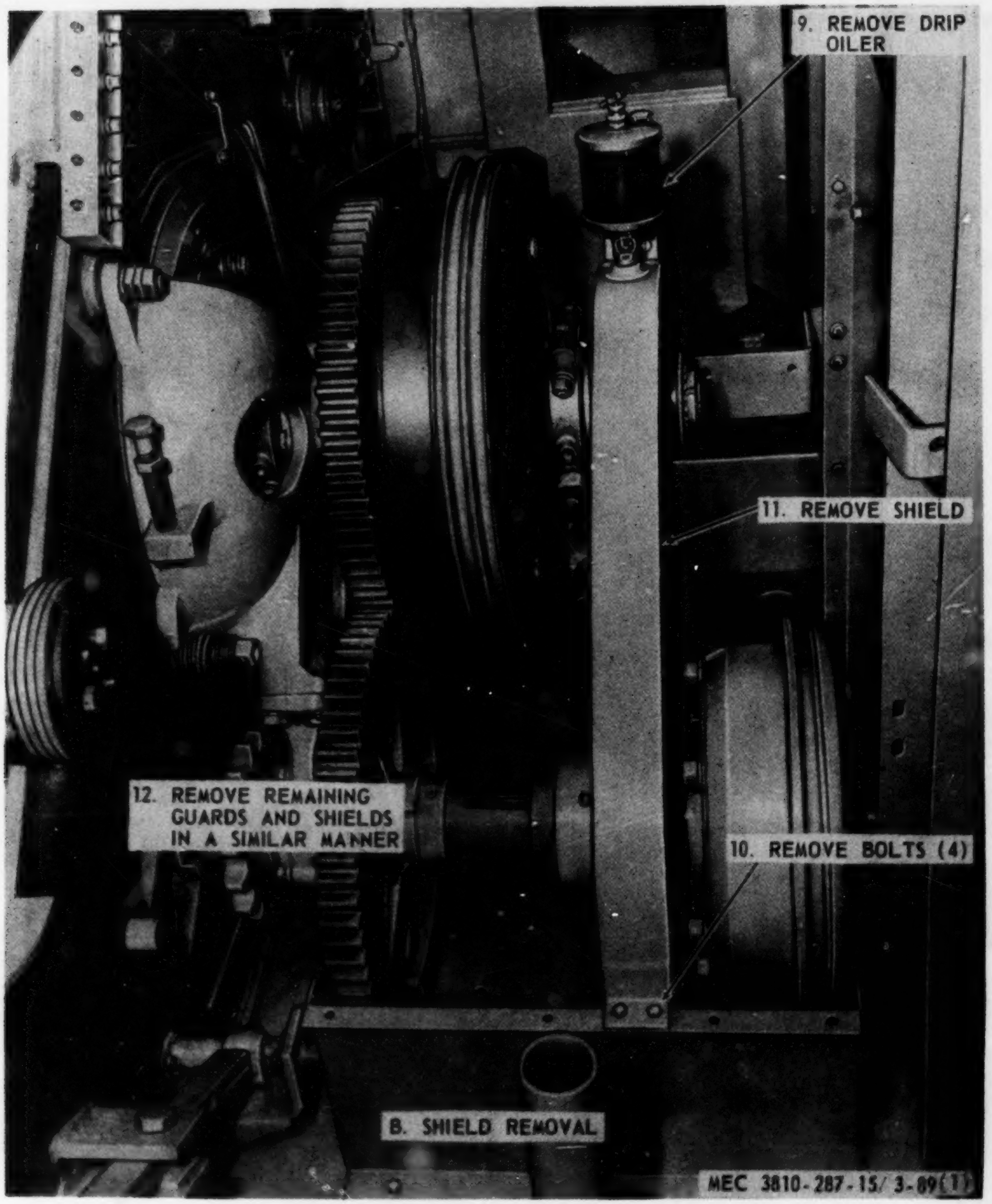

9. REMOVE DRIP OILER
11. REMOVE SHIELD
12. REMOVE REMAINING GUARDS AND SHIELDS IN A SIMILAR MANNER
10. REMOVE BOLTS (4)
B. SHIELD REMOVAL
MEC 3810-287-15/ 3-89(1)

Figure 3-89 (1). Guards and shields, removal and installation.

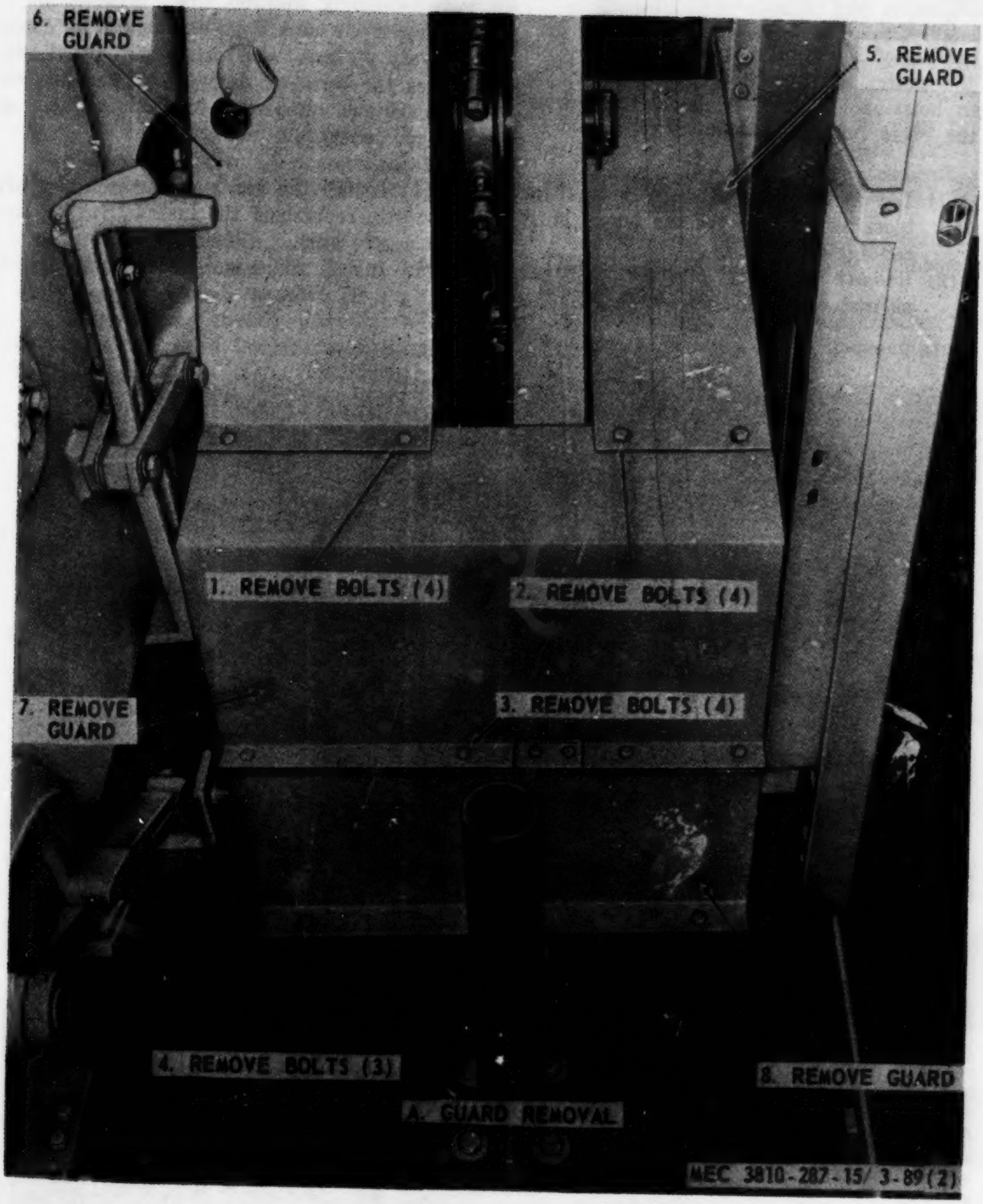

6. REMOVE GUARD
5. REMOVE GUARD
1. REMOVE BOLTS (4)
2. REMOVE BOLTS (4)
7. REMOVE GUARD
3. REMOVE BOLTS (4)
4. REMOVE BOLTS (3)
8. REMOVE GUARD
A. GUARD REMOVAL
MEC 3810-287-15/3-89(2)

Figure 3-89 (2).—Continued.

Section XIX. GANTRY FRAME ASSEMBLY

3-105. Gantry Sheaves and Shaft

a. General. The gantry sheaves are located at the top of the gantry frame and supported by the gantry shaft. The sheaves support the boom hoist cables from the boom hoist drum to the boom harness assembly.

b. Removal.

(1) Lower the boom to the ground or blocking and remove the boom hoist cable (para 2-6).

(2) Remove the gantry sheaves and shaft as instructed on figure 3-90.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects, and damage. Inspect the sheaves for worn or damaged cable grooves and bushings. Replace worn, defective, or damaged parts.

e. Installation.

(1) Install the gantry sheaves and shaft in reverse of the instructions on figure 3-90.

(2) Install the boom hoist cable (para 2-6).

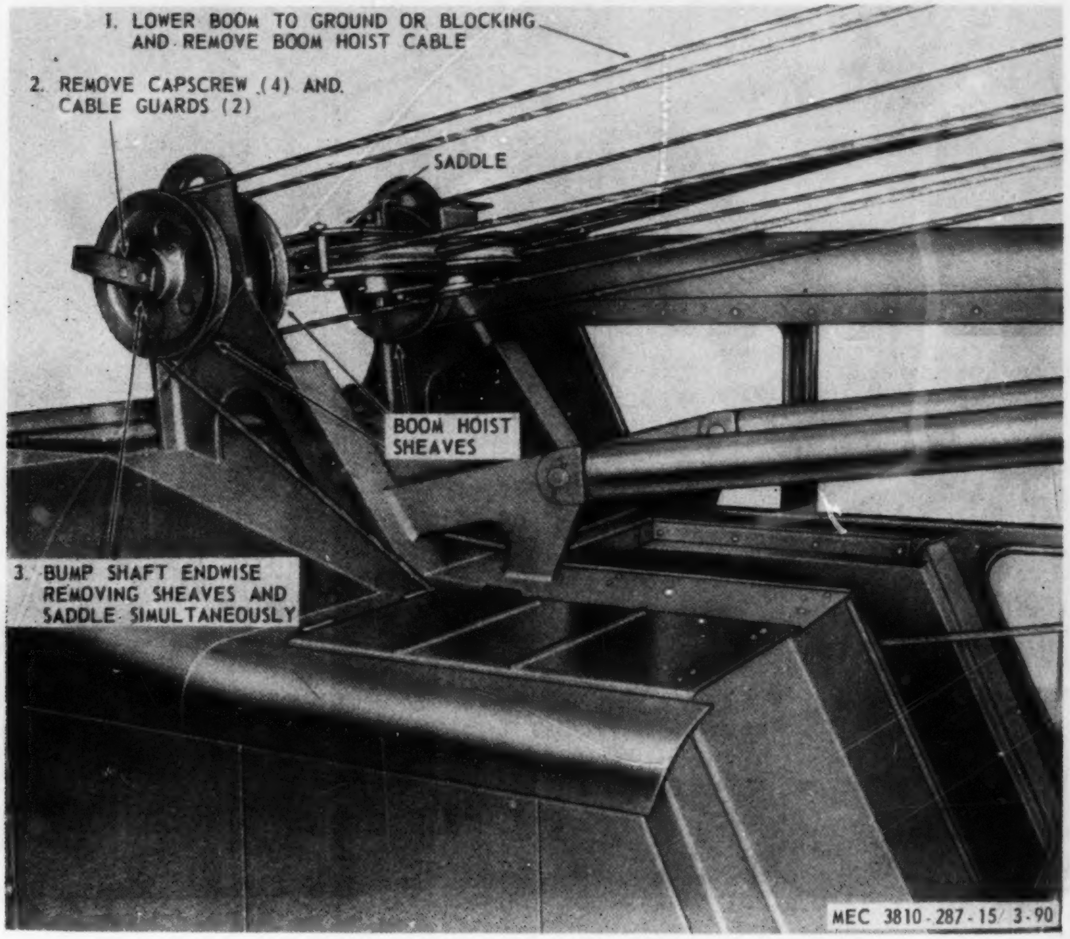

1. LOWER BOOM TO GROUND OR BLOCKING AND REMOVE BOOM HOIST CABLE
2. REMOVE CAPSCREW (4) AND CABLE GUARDS (2)
SADDLE
BOOM HOIST SHEAVES
3. BUMP SHAFT ENDWISE REMOVING SHEAVES AND SADDLE SIMULTANEOUSLY
MEC 3810-287-15/3-90

Figure 3-90. Gantry sheaves and shaft, removal and installation.

Section XX. CRAWLER ASSEMBLY

3-106. Crawler Drive Chains

a. General. The crawler drive chains are located at the rear of the crawler side frames and transmit power from the cross travel shaft to the crawler belts.

b. Removal. Remove the crawler drive chains as instructed on figure 3-91.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect the chains for wear, broken rollers, pins, and sidebars and other damage. Replace a worn, broken or damaged drive chain.

e. Installation. Install the crawler drive chains in reverse of the instructions on figure 3-91.

f. Adjustment. Adjust the crawler drive chains (para 3-22).

3-107. Crawler Belt Assemblies

a. General. The crawler belt assemblies are located on each side of the crawler frame and provide the propelling motion and floatation for the crane-shovel.

b. Removal. Remove the crawler belt assemblies as instructed on figure 3-92.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects, and damage. Replace worn, defective, or damaged parts.

e. Installation. Install the crawler belt assemblies in reverse of the instructions on figure 3-92.

f. Adjustment. Adjust the crawler belts (para 3-22).

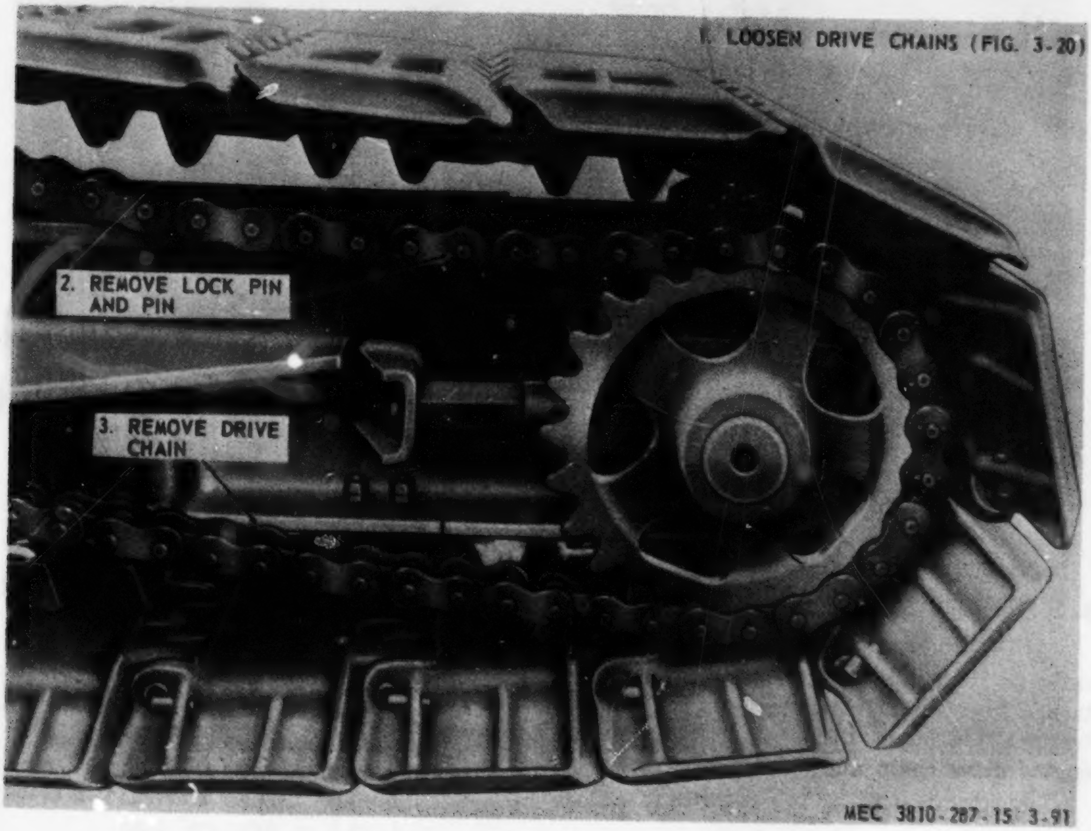

1. LOOSEN DRIVE CHAINS (FIG. 3-20)
2. REMOVE LOCK PIN AND PIN
3. REMOVE DRIVE CHAIN
MEC 3810-287-15 3-91

Figure 3-91. Crawler drive chains, removal and installation.

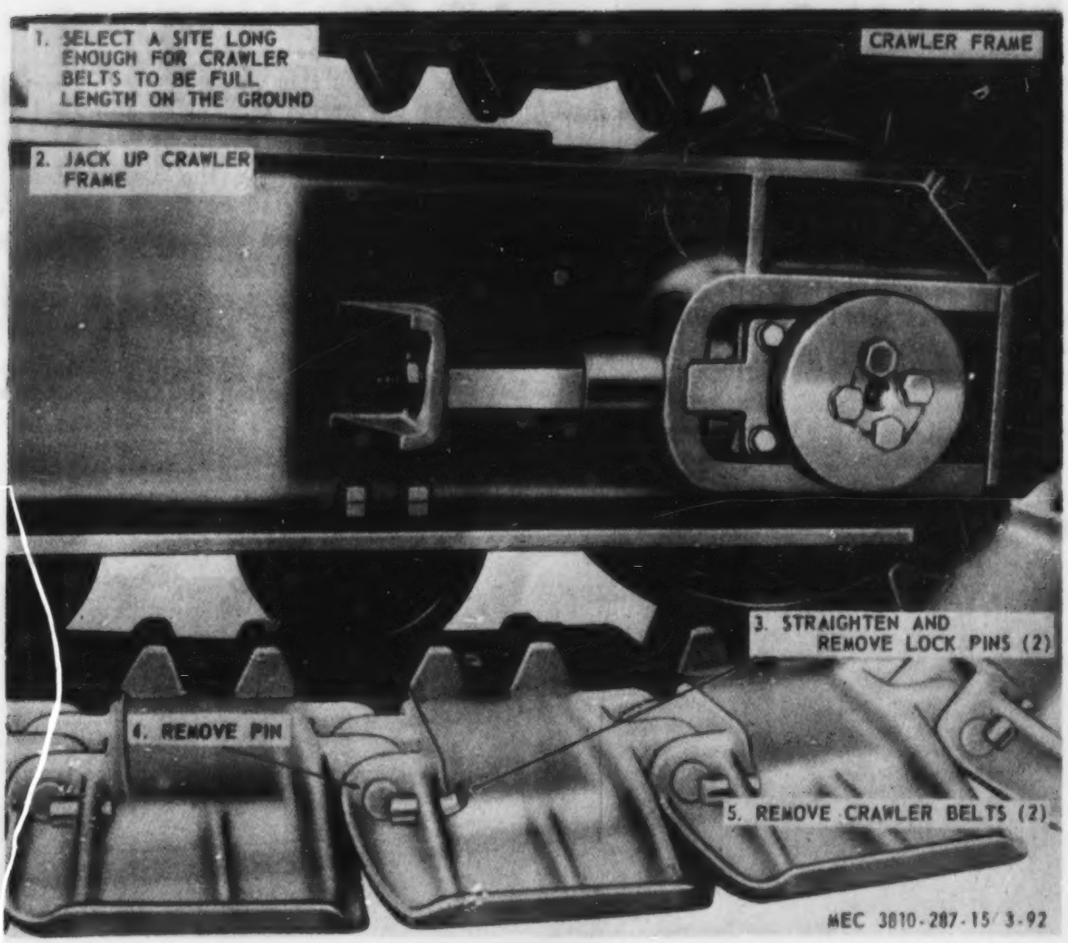

1. SELECT A SITE LONG ENOUGH FOR CRAWLER BELTS TO BE FULL LENGTH ON THE GROUND
CRAWLER FRAME
2. JACK UP CRAWLER FRAME
3. STRAIGHTEN AND REMOVE LOCK PINS (2)
4. REMOVE PIN
5. REMOVE CRAWLER BELTS (2)
MEC 3810-287-15/3-92

Figure 3-92. Crawler belt assemblies, removal and installation.

Section XXI. CHAIN CASE AND ENGINE DRIVE CHAIN ASSEMBLIES

3-108. Chain Case Assembly

a. General. The chain case assembly is located on the right side of the machine and attached to the right machinery frame and rear transmission support. The case encloses the engine drive chain and sprockets.

b. Removal. Remove the chain case assembly as instructed on figure 3-93.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

(2) Inspect the case for cracks, dents and damage. Repair or replace a cracked, dented or damaged case.

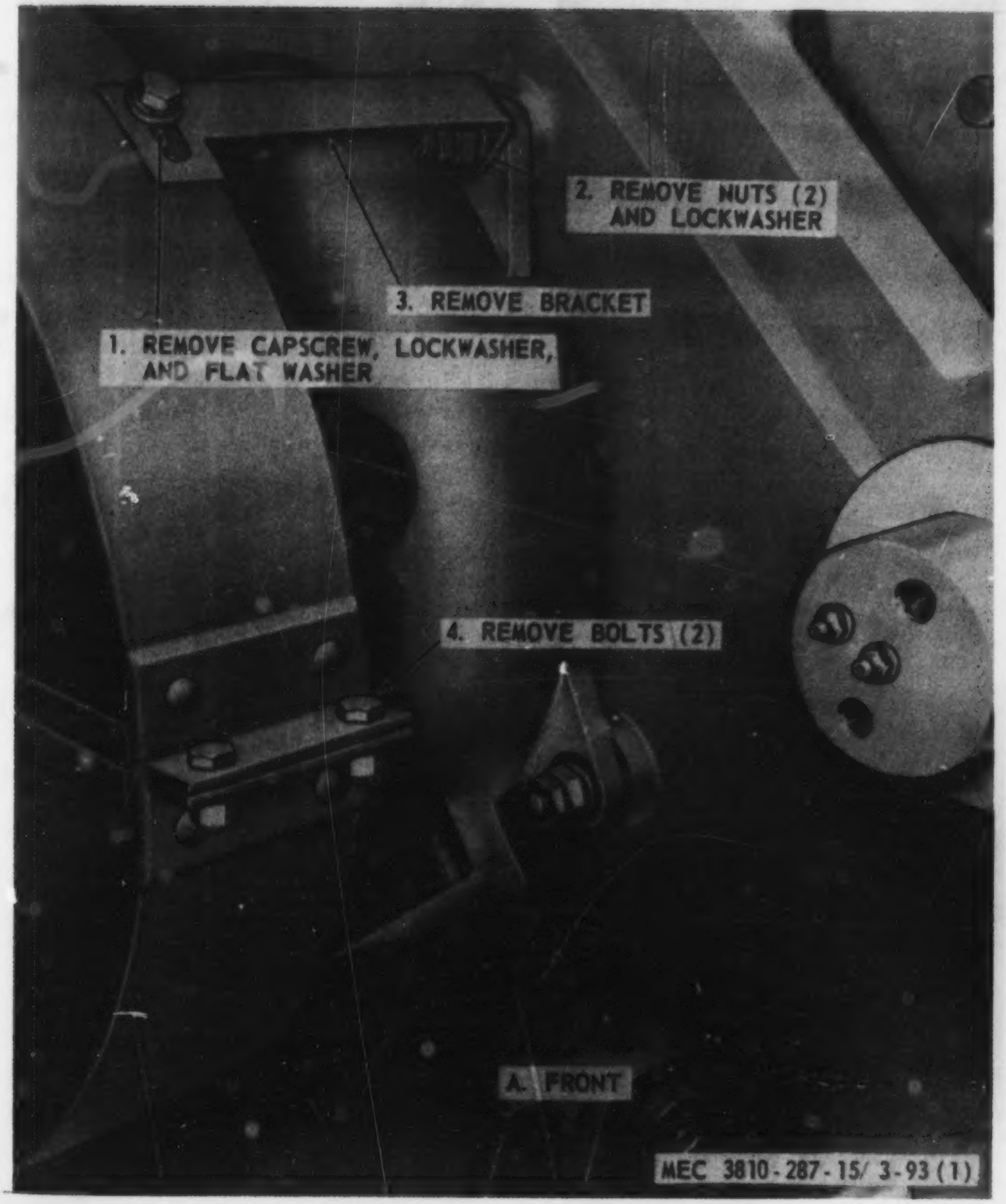
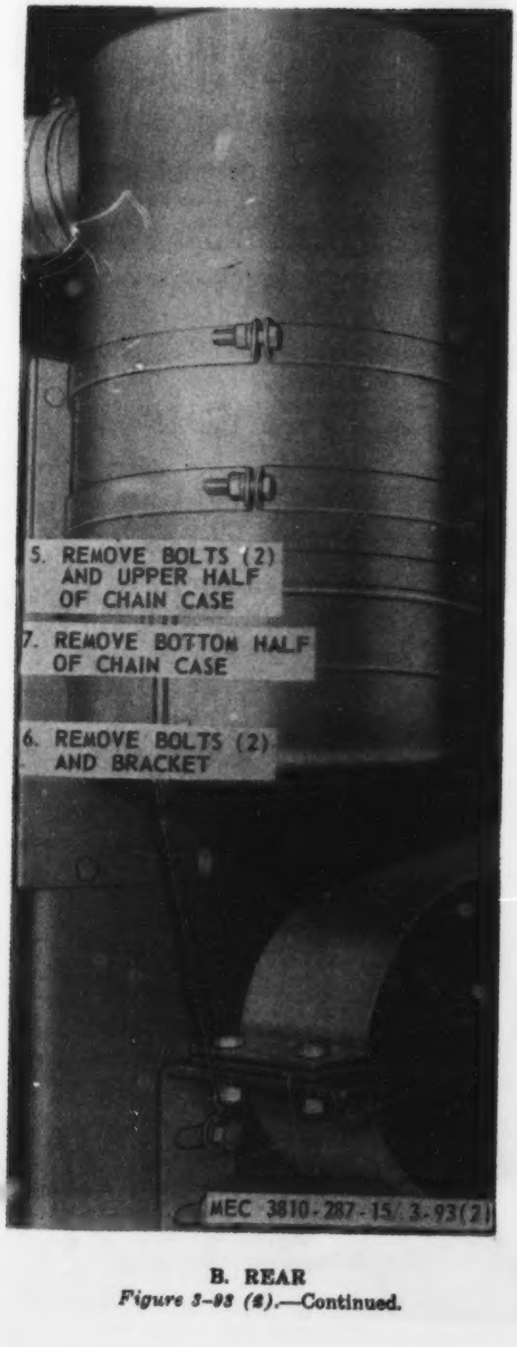

2. REMOVE NUTS (2) AND LOCKWASHER
3. REMOVE BRACKET
1. REMOVE CAPSCREW, LOCKWASHER, AND FLAT WASHER
4. REMOVE BOLTS (2)
A. FRONT
MEC 3810-287-15/ 3-93 (1)

Figure 3-93 (1). Chain case assembly, removal and installation.


5. REMOVE BOLTS (2) AND UPPER HALF OF CHAIN CASE
7. REMOVE BOTTOM HALF OF CHAIN CASE
6. REMOVE BOLTS (2) AND BRACKET
MEC 3810-287-15/3-93(2)

B. REAR

Figure 3-93 (2).—Continued.

e. Installation. Install the chain case assembly in reverse of the instructions on figure 3-93.

3-109. Engine Drive Chain Assembly

a. General. The engine drive chain is located in the chain case on the right side of the machinery frame. It transmits power from the engine transmission output shaft to the clutch shaft assembly.

b. Removal.

(1) Remove the chain case assembly (para 3-108).

(2) Remove the engine drive chain as instructed on figure 3-94.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects, and damage. Replace worn, defective or damaged parts.

e. Installation.

(1) Install the engine drive chain assembly in reverse of the instruction on figure 3-94.

(2) Adjust the engine drive chain as instructed on figure 3-95.

(3) Reinstall the chain case assembly (para 3-108).

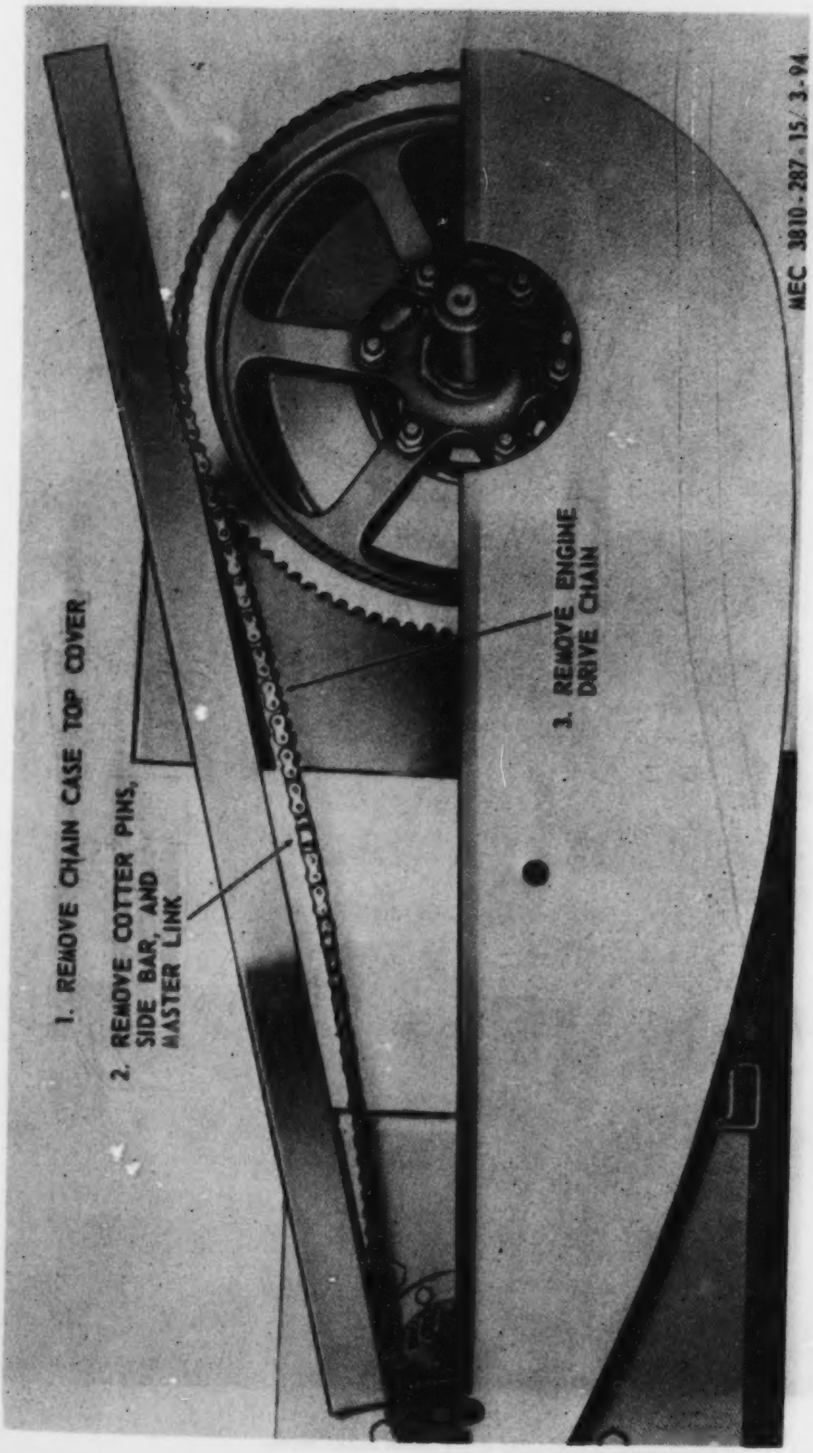
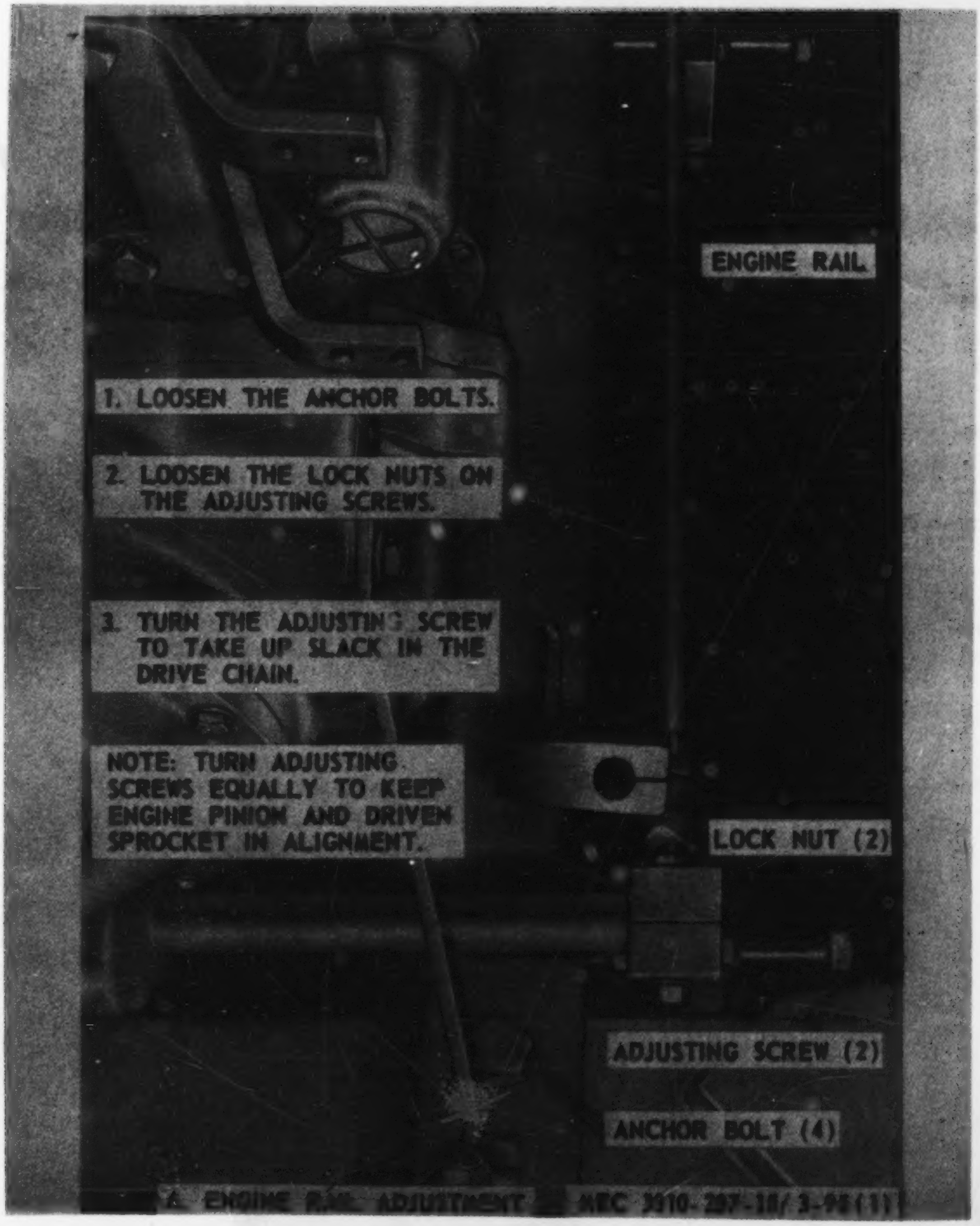

1. REMOVE CHAIN CASE TOP COVER
2. REMOVE COTTER PINS, SIDE BAR, AND MASTER LINK
3. REMOVE ENGINE DRIVE CHAIN
MEC 3810-287-15/3-94

Figure 3-94. Engine drive chain assembly, removal and installation.


ENGINE RAIL
LOCK NUT (2)
ADJUSTING SCREW (2)
ANCHOR BOLT (4)

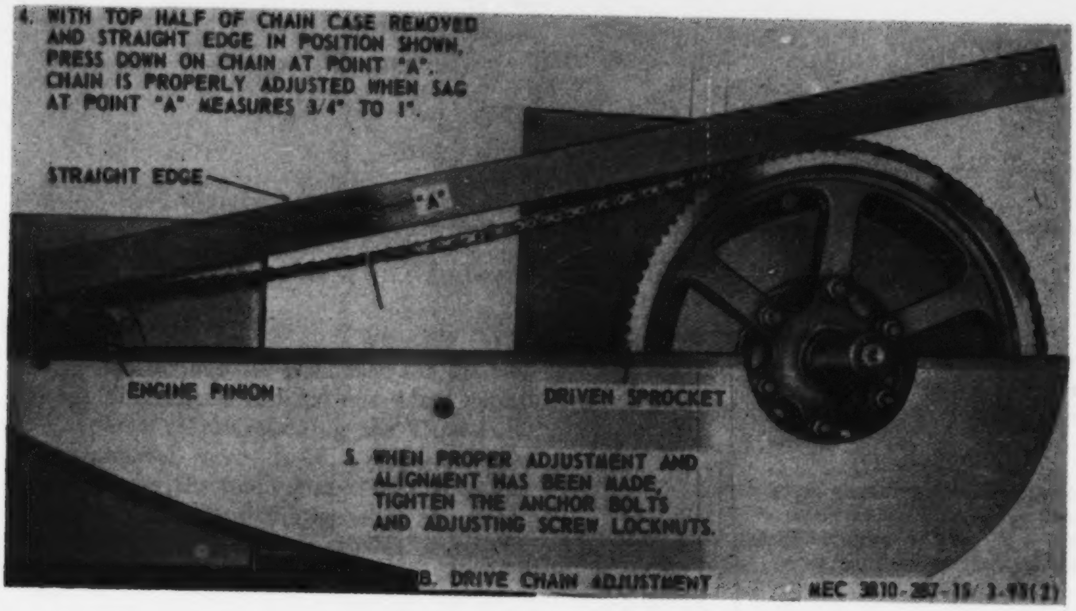
1. LOOSEN THE ANCHOR BOLTS.
2. LOOSEN THE LOCK NUTS ON THE ADJUSTING SCREWS.
3. TURN THE ADJUSTING SCREW TO TAKE UP SLACK IN THE DRIVE CHAIN.

NOTE: TURN ADJUSTING SCREWS EQUALLY TO KEEP ENGINE PINION AND DRIVEN SPROCKET IN ALIGNMENT.

A. ENGINE RAIL ADJUSTMENT

MEC 3810-287-15/3-95(1)

Figure 3–95 (1). Engine drive chain adjustment.


STRAIGHT EDGE
"A"
ENGINE PINION
DRIVEN SPROCKET

4. WITH TOP HALF OF CHAIN CASE REMOVED AND STRAIGHT EDGE IN POSITION SHOWN, PRESS DOWN ON CHAIN AT POINT "A". CHAIN IS PROPERLY ADJUSTED WHEN SAG AT POINT "A" MEASURES 3/4" TO 1".

5. WHEN PROPER ADJUSTMENT AND ALIGNMENT HAS BEEN MADE, TIGHTEN THE ANCHOR BOLTS AND ADJUSTING SCREW LOCKNUTS.

B. DRIVE CHAIN ADJUSTMENT

MEC 3810-287-15/3-95(2)

Figure 3-95.—Continued.

CHAPTER 4

INTRODUCTION

Section I. GENERAL

4-1. Scope

These instructions are published for the use of direct and general support and depot maintenance personnel maintaining the Thew-Lorain crane-shovel, model L-36M. They provide information on the maintenance of the equipment, which is beyond the scope of the tools, equipment, personnel, or supplies normally available to using organizations.

4-2. Record and Report Forms

For record and report forms applicable to direct and general support and depot maintenance, refer to TM 38-750.

Note. Applicable forms, excluding Standard Form 46 (United States Government Motor Vehicles Operator's Identification Card) which is carried by the operator, shall be kept in a canvas bag mounted on the equipment.

Section II. DESCRIPTION AND TABULATED DATA

4-3. Description

For a complete description of the Lorain, model L-36M crane-shovel, see paragraph 1-3.

4-4. Tabulated Data

a. General. This paragraph contains all the overhaul data pertinent to direct and general support and depot maintenance personnel. A hydraulic diagram (fig. 4-1) is also included.

b. Engine Classification and Rating.

Number of cylinders	3
Bore	4 1/4 in.
Stroke	5 in.
Compression ratio	17 to 1
Total displacement (cubic inches)	213
Firing order	1-3-2
Number of main bearings	4

Table 4-1. Repair and Replacement Standards

Component	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Minimum	Maximum	Minimum	Maximum	
ENGINE					
Cylinder Head:					
Longitudinal warpage	----	----	----	----	.0065
Transverse warpage	----	----	----	----	.004
Distance between top and bottom faces	3.536	----	----	----	.020
Cam follower bores	1.063	1.062	----	----	.002
Cam follower I.D.	1.060	1.061			
Cam follower clearance	.001	.003	.001	.003	.006
Valve And Operating Mechanism:					
Rocker arm shaft O.D.	.8735	.8740			
Rocker arm bushing I.D.	.8750	.8760	.001	.0025	.004

Table 4-1. Repair and Replacement Standards—Continued.

Component	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Minimum	Maximum	Minimum	Maximum	
Exhaust valve seat angle 30°					
Valve to guide clearance	----	----	----	----	.006
Valve seat counterbore	1.626	1.627			
Crankshaft Journal taper	----	.001	----	----	.0015
Journal out-of-round	----	----	----	----	.002
End play	----	.001	----	----	.011—.018
Connecting rod journal dia.	2.749	2.750			
Main bearing dia.	3.499	3.500			
Main bearing shell thickness	----	.153			
Pistons and cylinder liners					
Cylinder liner O.D.	4.625	4.626			
Cylinder liner I.D.	4.2495	4.2511			
Piston to cylinder liner	----	----	----	----	.012
Shaft diameter at gear	1.1875	1.1880			
Length—thrust bearing end journal	2.8740	2.8760			
End thrust	.0040	.0120	----	----	.0180
Thrust washer thickness	.1200	.1220			
BALANCE SHAFT					
Shaft diameter at bearings	1.4970	1.4975			
Shaft diameter at gear	1.1875	1.1880			
Length-thrust bearing end journal	2.8740	2.8760			
End thrust	.0040	.0120	----	----	.0180
Thrust washer thickness	.1200	.1220			
CAMSHAFT AND BALANCE SHAFT BEARINGS					
Inside Diameter:					
Front and rear	1.5000	1.5010			
Center and intermediate	1.5010	1.5030			
Clearance-bearings-to-shaft:					
Front and rear (next to flange)	.0025	.0040	----	----	.0060
Center and intermediate	.0025	.0050	----	----	.0090
Outside diameter Of Bearings:					
Front and rear	2.1880	2.1885			
Intermediate	2.1840	2.1860			
Diameter of block bore	2.1875	2.1885			
Clearance-Bearings-To-Block:					
Front and rear	.001 (Press)	.005 (Loose)			
Intermediate	.0015	.0045			
CAMSHAFT AND BALANCE SHAFT GEARS					
Backlash	.0030	.0080	----	----	.010
Gear inside diameter	1.1865	1.1875			
Clearance-gear-to-shaft	.0015 Press	.0000			
IDLER GEAR					
Backlash	.0030	.0080	----	----	.010
Preload-variation on pull 2 lbs.—11 oz.	1/2 lb.	6 3/4 lbs.	----	----	1/2—6 3/4 lbs.
CRANKSHAFT TIMING GEAR					
Backlash	.0030	.0080	----	----	.010
Gear inside diameter	4.7490	4.7500			
Clearance-gear-to-crankshaft	.001 (Press)	.001 (Loose)			

Table 4-1. Repair and Replacement Standards—Continued.

Component	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Minimum	Maximum	Minimum	Maximum	
BLOWER DRIVE GEAR					
Backlash	.0030	.0080	----	----	.010
Gear-to-hub fit	.0005 (Press)	.0010 (Loose)			
Support-to-end plate	.0005 (Press)	.0025 (Loose)			
Support bushing inside diameter	1.6260	1.6265			
Hub diameter-at bushing	1.6240	1.6250			
Piston pin bushing I.D.	1.5025	1.5030			
Piston pin O.D.	1.4996	1.5000			
Piston pin to piston bushing clearance	.0025	.0034	----	----	.010
Connecting rods					
Connecting rod bushing I.D.	1.5015	1.5020			
Connecting rod bushing to pin clearance	.0015	.0024	----	----	.010
Connecting rod bearing to crankshaft clearance	.0014	.0044	----	----	.006
Connecting rod side clearance	.006	.012	----	----	.012
CAMSHAFT:					
Shaft Diameter-At Bearings					
Front and rear	1.4970	1.4975			
Center and intermediate	1.4980	1.4985			
Hub-to-support bushing clearance	.0010	.0025	----	----	.0050
Hub-to-cam clearance	.0020	.0070			
End thrust	.0050	.0080	----	----	.0100
SHAFT HORIZONTAL REVERSING GRIND	2.5589	2.5593	----	----	Mounted on anti-friction bearings
Spline data					
Number of teeth–13					
Diameter pitch 6/12					
Pressure angle 30°					
Base circle dia. (ref.) 1.8764"					
Max. out of roundness .001"					
Max. cumulative pitch any teeth .0015"					
Max. involute profile error .0008"					
Max. lead error .0005"					
Key $\frac{6225"}{6210"}$					
SHAFT R.H. CLUTCH	----	----	----	----	Mounted on anti-friction bearings
Journal					
1	1.7578	1.7660			
2	1.680	1.690			
3	2.246	2.247			
4	2.3508	2.3590			
5	2.3739	2.3750			
6	2.5589	2.5593			
7	2.6257	2.6662			
8	2.720	2.750			
9	2.459	2.469			
SHAFT L.H. CLUTCH	----	----	----	----	Mounted on anti-friction bearings
Journal					
1	2.459	2.469			
2	2.5592	2.5596			

Table 4-1. Repair and Replacement Standards—Continued.

Component	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Minimum	Maximum	Minimum	Maximum	
3 (collar)	2.720	2.750			
4	2.6257	2.6262			
5	2.5589	2.5593			
6	2.5007	2.5012			
7	2.4364	2.4375			
INVOLUTE SPLINE DATA					
Number of teeth-13					
Diameter pitch 6/12					
Pressure angle 30°					
Base circle dia. (ref.) 1.8764					
Max. out of roundness .001"					
Max. cumulative pitch error any (2) teeth .0015"					
Max. involute profile error .0008"					
Max. lead error .005					
SPROCKET AND HUB	----	----	----	----	Mounted on anti-friction bearings
Bearing bore to run concentric with bottom dia. of sprocket within .008 T.I.R. (total indicator reading)					
Bearing bore	4.249	4.250			
Dia. of hub	8.999	9.001			
Max. run out .008 T.I.R.					
15T 1 1/2 pitch ASA #120 roller chain (ref.)					
Gage $\frac{8.050}{8.040}$ over					
.875 dia. pin					
CLUTCH SLIDING JAW					
O.D. 4 3/8"					
I.D.	2.5638	2.5649	.004	.006	Not applicable
Keyway	.625	.627	.0065	.009	Not applicable
GEAR-SPUR	----	----	----	----	Permanent fit
O.D. Finish turn	17.995	18.000			
P.D. 17.50					
Ream	2.5595	2.5612			
Width	1.495	1.505			
Hub 3 11/16"					
Backlash — .005"	----	----	----	----	.010
BLOCK-PILLOW	----	----	----	----	Anti-friction bearing
Bore	4.7242	4.7252			
GEAR-SPUR	----	----	----	----	Anti-friction bearing
O.D.	17.995	18.002			
P.D. 17.50					
Dia. of bore both ends	4.226	4.230			
Inside collar rough bore 3 3/4"					
Hub dia. 5 1/2"					
Hub width	8.620	3.630			
70 cut teeth 4DP 20-64 Thew Std. Tooth form (20° std. involute)					
Allow .005 backlash on cutter. To	----	----	----	----	.010
measure $\frac{18.112}{18.108}$					
dia. over .4375 dia. pins					

Table 4-1. Repair and Replacement Standards—Continued.

Component	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Minimum	Maximum	Minimum	Maximum	
Meshes with E-117 has .005 backlash	----	----	----	----	.010
GEAR-MITER BEVEL	----	----	----	----	Anti-friction bearing
O.D.	8.999	9.001			
Dia. of bore both ends	4.249	4.250			
Rough bore 3 3/4"					
Major addendum circle dia.	----	9.2415			
24 cut teeth-2 3/4" D.P. Thew #20-64 tooth form (Std. 20" involute) .015 backlash on pitch line has been allowed	----	----	----	----	.020
SPROCKET 15-TOOTH:					
O.D. 7 $\frac{31\pm}{32}$ -- .015					
P.D.7.215					
R.D.	6.327	6.343			
Bore (Bushing)	2.5621	2.5688	.0028	.0099	.015
Note. $\frac{8.053''}{8.037''}$					
gage dim. over .075" dia. pin with bore dia. .015 T.I.R.					
R.H. Support:					
Clutch SH Bearing Core 4 1/2"					
L.H. SUPPORT CLUTCH:					
SH Bearing Core	4.7242	4.7262			
COLLAR - CONE SHIFTER:					
Slot width	.562	.567	.010	.028	.035
I.D.	2 9/16	+.010 -.000			
O.D.	3 3/4				
BEARING BALL	----	----	----	----	Not applicable
Bore	2.569				
O.D.	4.7244				
CONE-TAPERED ROLLER BEARING	----	----	----	----	Not applicable
I.D.	2.5000	2.5005			
CONE-TAPERED ROLLER BEARING	----	----	----	----	Not applicable
I.D.	2.6250	2.6255			
BEARING BALL	----	----	----	----	Not applicable
Bore	2.5691				
O.D.	4.7244				
BEARING-SELF ALIGNING BALL	----	----	----	----	Not applicabl
Bore	2.5591				
O.D.	4.7244				
RATCHET AND SPROCKET					
O.D.	24.310	24.320			
Bore dia. both sides	3.250	3.251	----	----	Permanent fit
Gauge $\frac{24.275}{24.265}$ over .875 dia. pins					
Finish teeth 125 all over use ASA sprocket cutter .875 roller dia. 49T 1 1/2 P. ASA #120 roller chain					

Table 4-1. Repair and Replacement Standards—Continued.

Component	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Minimum	Maximum	Minimum	Maximum	
DRUM L.H.	----	----	----	----	Mounted on anti-friction bearings
Total O.D. 20 1/4 dia. outside flange dia	16.622	16.624			
Bore ends-both sides between main flanges 7 19/32"	4.2465	4.2495			
SHAFT DRUM	----	----	----	----	Mounted on anti-friction bearings
Journal					
1 (RC60–63)	3.249	3.250			
2 (RC60–63)	3.249	3.250			
3 (RC60–63)	3.249	3.250			
Keyway	.7460	.7475			
SPROCKET and HUB	----	----	----	----	Mounted on anti-friction bearings
Sprocket					
O.D.	8.999	9.001			
Bore both ends	4.249	4.250			
Hub					
O.D.	7.995	8.005			
Bearing bores to run concentric with bottom dia. of sprocket within .006 T.I.R.					
Max. runout .003 T.I.R.					
15T 1 1/2 Pitch ASA #120 roller chain (ref.)					
Gage $\frac{8.060}{8.040}$ over					
.875 dia. pin					
BEARING-BRAKE SHAFT	1.251	1.255	.001	.004	.010
FLOATING and A-FRAME					
HARNESS SHEAVE					
O.D. 13 1/2" (ref.)	3.500	3.502			
Sheave Bores:					
O.D. 14"					
Bore dia. (bushed)	3.007	3.009	.003	.007	.015
Group-Sheave:					
O.D. 14"					
Bore dia. (bushed)	3.2538	3.2557	.0038	.0107	.020
Plug must pass through Ream if under 3.253" dia.					
CLUTCH-SLIDING JAW					
Major dia.	3.6667	3.6677	.0037	.0067	.012
Minor dia.	3.333	3.337	.027	.0527	
Pitch 3.500" dia.					
T.I.F. 3.636 (True involute form)					
Number of teeth–21					
Dia. Pitch—6/12					
Pressure Angle—30°					
Base Circle Dia.–3.0317					
Max. out of roundness—.0032					
Max. cumulative pitch error any 2 teeth—.0015					
Max. involute profile error—.0006					
Max. lead error–.004					
CLUTCH-SLIDING JAW					
Major dia.	3.6667	3.6677	.0037	.0067	.012
Minor dia.	3.333	3.337	.027	.0527	

Table 4-1. Repair and Replacement Standards—Continued.

Component	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Minimum	Maximum	Minimum	Maximum	
Pitch dia. 3.500"					
T.I.F. 3.636					
INVOLUTE SPLINE DATA					
Number of teeth-21					
Diameteric pitch-6/12					
Pressure angle-30°					
Base circle dia.-3.0311					
Max. out of roundness—.0032					
Max. cumulative pitch error any 2 teeth—.0015					
Max. involute profile error-.0006					
Max. lead error—.0004					
GEAR-SPUR SWING					
O.D.	17.670	17.680			
O.D. Bore	5.5095	5.5115	Permanent fit with bushing.		
Jaw O.D.	6.115	6.120			
I.D.	4.4900	4.4910	Permanent fit with bushing.		
Rim	3.026	3.036			
Gear tooth data 52 teeth 3 D.P. 17.3333 P.D. Thew modified long and short addendum involute pressure angle 25°					
Backlash	.025	.030	----	----	.050
Teeth measure 17.843					
17.8322 over .56951 pin dia.					
Finish gear teeth 125 all over to mesh with E-11547 vert. rev. pinion and E-10515 travel gear.					
BUSHING					
O.D.	5.512	5.514	----	----	Press fit
I.D.	3.761	3.763	.0082	.0107	.015
CLUTCH and RELATED PARTS					
Shoe - Brake					
Section - 1/4"					
Hub - Clutch					1/8"
O.D.	3.536	3.538			
I.D.	2.2595	2.5612			Permanent fit
Hub - Clutch					
O.D.	3.536	3.538	----	----	Permanent fit
I.D.	2.4375	2.4392			
CONE-CLUTCH					
I.D.	3.553	3.556	.015	.020	.030
O.D. must be concentric with bore within .010 T.I.R. after hardening.					
O.D.	4.995	5.005			
O.D.	5.995	6.005			
DRUM - CLUTCH					
I.D.	17.990	18.000	----	----	1/8"
DRUM - CLUTCH					
I.D.	18.490	18.500	----	----	1/8"
SPROCKET					
I.D.	6.000	6.002"	----	----	Not applicable
O.D.	12.77	12.85			
25T-1 1/2" P ASA #120 roller chain use ASA sprocket cutter (.875" roller dia.)					
Hub for split sprocket	----	----	----	----	Anti-friction bearing

Table 4-1. Repair and Replacement Standards—Continued.

Component	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Minimum	Maximum	Minimum	Maximum	
I.D.	4.7237	4.7245			
SPROCKET 55T					
I.D.	14.620	14.630	----	----	Not applicable
Use ASA sprocket cutter (.875" roller dia.) 55T					
1 1/2" P ASA #120H roller chain					
HUB-DRUM MOUNTING					
Minor dia.	2.0000	2.0035	----	----	Permanent fit
P.D. 2.1667"					
Major dia.	2.3333	2.3353			
Involute spline data					
Number of teeth—13					
Dia. pitch—6/12					
Pressure angle–30°					
Max. out of roundness .001"					
Base circle dia. 1.8764"					
Max. cumulative pitch error (any 2 teeth .0015")					
Max. involute Profile error .0006"					
Max. lead error .0004"					
DRUM - BRAKE					
14.120" dia.	----	----	----	----	1/8"
SPROCKET DRIVEN	----	----	----	----	Anti-friction bearing
Left end I.D.	4.7485	4.7517			
Inside I.D. 4 1/2"					
Right end I.D.	4.7228	4.7237			
Sprocket data:					
24 teeth 1" pitch #80 roller chain 625" roller dia.					
BUSHING					
I.D.	3.260	3.270	.005	.025	.040
O.D. 4 1/4"					
BEARING BALL					
O.D. 4.7244"					
Bore 2.5591"					
COLLAR	----	----	----	----	Not applicable
I.D. 2 9/16"					
O.D 3 3/4"					
HUB-DRUM MOUNTING	----	----	----	----	Permanent fit
Minor dia.	2.0000	2.0035			
P.D. 2.1667"					
Major dia.	2.3333	2.3353			
INVOLUTE SPLINE DATA					
Number of teeth—13					
Dia. pitch—6/12					
Pressure angle—30°					
Max. out of roundness—.001					
Base circle dia.—1.8764					
Max. cumulative pitch error—any 2 teeth—.0015					
Max. involute profile error—.0006"					
Max. lead error—.0004"					
DRUM-BRAKE	----	----	----	----	Keyed fit
I. Dia. 14.120"	----	----	----	----	1/8"
Drum—R.H.					

Table 4-1. Repair and Replacement Standards—Continued.

Component	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Minimum	Maximum	Minimum	Maximum	
Drum-Hoist and Drag:					
O. D.	24	24	----	----	1/8"
T-15067					
3rd drum					
dia. center bore	7.500	7.502			
O. D.	12.750	12.790			
CLUTCH-SLIDING JAW					
I. D.	2.5633	2.5649	----	----	Keyed fit
BUSHING					
Bore	3.259	3.261	.009	.017	.025
O. D.	3.7519	3.7538			
BUSHING					
I. D.	1.2544	1.2558	.0044	.0098	.015
O. D.	1.6264	1.6278			
BUSHING					
I. D.	1.255	1.260	.005	.014	.020
O. D.	1.5640	1.5655			
SHAFT-R.H. HORIZONTAL REVERSING	----	----	----	----	Anti-friction bearings
Grind	2.5589	2.5593			
SPLINE DATA					
Number of teeth—13					
Dia. pitch—6/12					
Pressure angle—30°					
Base circle dia.—1.8764					
Max. out of roundness—.001					
Max. cumulative pitch error—any 2 teeth—.0015					
Max. involute profile error—.0006					
Max. lead error—.0005					
GEAR DRIVE	----	----	----	----	Not applicable
I. D.	4.750	4.751			
O. D.	16.662	16.672			
SPROCKET 16T	----	----	----	----	Anti-friction bearing
Power Load Lowering:					
I. D.	4.7237	4.7245			
O. D.	5.750	5.752			
GEAR-DRIVEN	----	----	----	----	Anti-friction bearing
Left side:					
I. D.	4.7485	4.7515			
Right side I. D.	4.7485	4.7515			
American Standard involute system full depth 57 x teeth 20° P.A. 3 D.P. Sharper cutter Thew-Cat. No. 132036 .005 backlash—.56951 dia. pin dia. over pins 19.7656 ± .002					
CLUTCH-SLIDING JAW					
I. D.	2.5633	2.5649	----	----	Not applicable
BEARING — BALL					
I. D. Bore	2.5591				
O. D.	4.7244				
BEARING					
Bore	2.5591				
O. D.	4.7244				
SPROCKET 15 TOOTH	----	----	----	----	Not applicable
I. D.	3.000	3.002			

Table 4-1. Repair and Replacement Standards—Continued.

Component	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Minimum	Maximum	Minimum	Maximum	
O. D. 7 31/32 ±.015					
P. D. 7.215					
R. D.	6.327	6.343			
8.053"					
8.037"					
gage dim. over .875 pins					
BUSHING					
I. D.	2.5621	2.5688	.0028	.0099	.015
O. D.	3.0018	3.0036			
SPROCKET-ENGINE	----	----	----	----	Permanent fit
Minor dia. (inside)	1.592	1.598			
Major dia. (inside)	1.749	1.750			
19 cut teeth for 3/4 pitch ASA No. 60 quadruple roller chain use ASA std. cutter (469 roller dia.) 125 finish all over unless otherwise specified.					
SPROCKET-MAIN DRIVE	----	----	----	----	Permanent fit
Bore I. D.	2.3750	2.3761			
100 cut teeth for 3/4 pitch ASA 60 quadruple roller chain use ASA std. cutter.					
PULLEY-PUMP DRIVE	----	----	----	----	Not applicable
Shaft dia. 5/8"					
Keyway 3/16 x 3/32					
Bushing D-10207					
I. D.	3.5040	3.5060			
O. D.	4.1270	4.1290			
Taper	.007	.008			
ROLLER-FRONT IDLE	----	----	----	----	Not applicable
I. D.	3.4945	3.4960			
SHAFT-FRONT ROLLER	----	----	----	----	Not applicable
Grind O. D.	3.4943	3.4953			
ROLLER-DRIVE	----	----	----	----	Not applicable
Bore dia.	3.4945	3.4960	----	----	Not applicable
SHAFT-DRIVE ROLLER	----	----	----	----	Not applicable
Grind O. D.	3.4943	3.4953			
SHAFT-TRUCK OUTER DRIVE	----	----	----	----	Not applicable
Journal	3.9985	3.9999	----	----	Not applicable
Collar 4 1/2"					
Journal 2	3.9958	3.9985	----	----	Not applicable
Major dia.	3.9958	3.9985	.0015	.0053	.010
Minor dia.	3.6076	3.6293			
INVOLUTE EXTERNAL SPLINE DATA					
Number of teeth—23					
Diametral pitch—6/12					
Pressure angle—30°					
Base circle dia.—3.3198"					
Max. out of roundness—.0012"					
Max. cumulative pitch error (any 2 teeth)—.0015"					
Max. involute profile error—.0006"					
Max. lead error—.0004"					
CLUTCH-JAW	----	----	----	----	Not applicable
Minor dia.	3.6667	3.6702			
Major dia.	4.0000	4.0011	.0015	.0053	.010
Pitch 3.833					

Table 4-1. Repair and Replacement Standards—Continued.

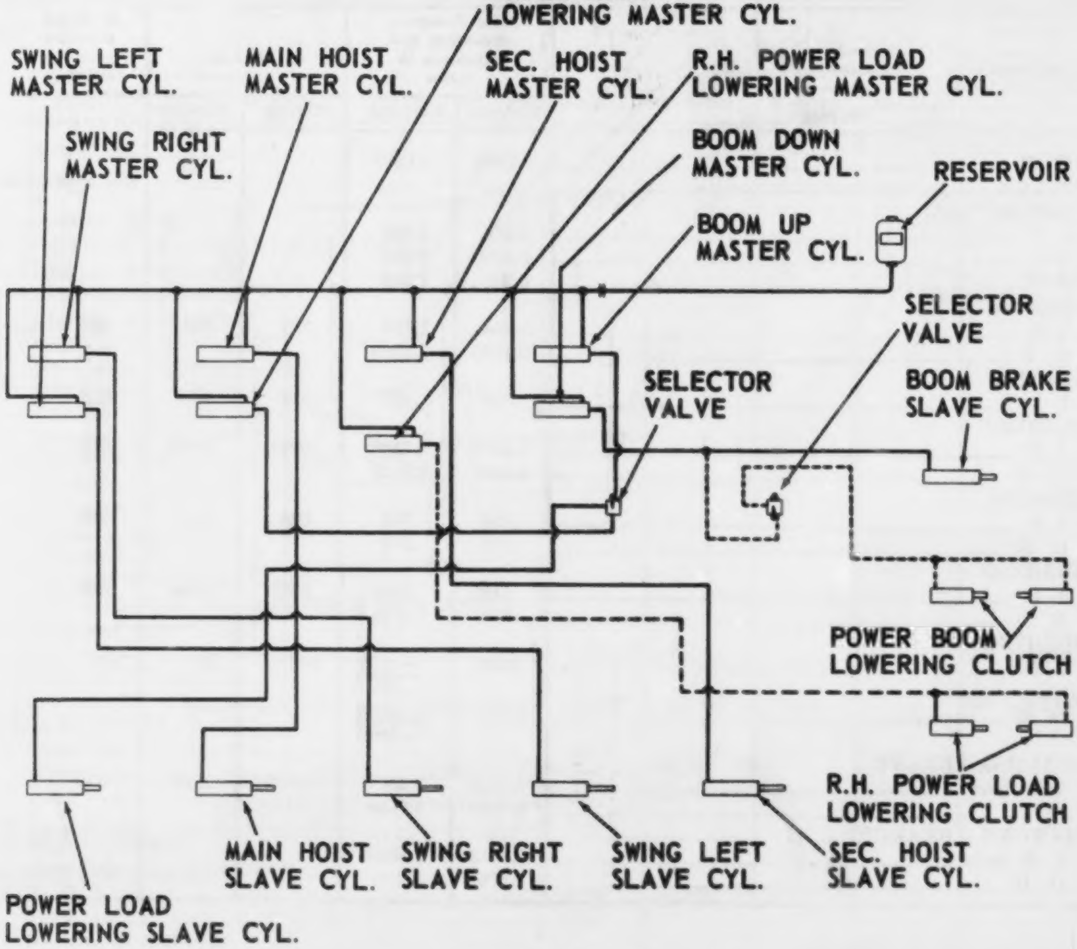
Component	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Minimum	Maximum	Minimum	Maximum	
INVOLUTE SPLINE DATA					
Number of teeth—23					
Diametral pitch—6/12					
Pressure angle—30°					
Base circle dia.—3.3198					
Max. out of roundness—.0012					
Max. cumulative pitch error (any 2 teeth .0015)					
Max. involute profile error—.0006					
Max. lead error—.0004					
Major dia. fit sliding mates with E-79996					
CLUTCH-JAW	----	----	----	----	Not applicable
Minor dia.	3.6667	3.6702			
Major dia.	4.0000	4.0011			
T. I. F. 3.969					
SHAFT-TRUCK INNER DRIVE	----	----	----	----	Not applicable
Journal #1	2.248	2.250			
Journal #2	4.0000	4.0015			
Journal #3—4 1/2" dia.					
Journal #4	4.0000	4.0015			
Journal #5	2.248	2.250			
Collar:					
O. D. 11 7/8"					
I. D. 5 1/4"					
SPROCKET-3T DRIVE					
P. D.	8.014	----	----	----	Not applicable
No. I. D. or O. D. given					
BUSHING					
I. D.	2.255	2.257	.005	.009	.015
O. D.	2.748	2.750			
BEARING	----	----	----	----	Anti-friction bearing
I. D.	4.000	+.001 -.000			
O. D.	6.1875	+.001 -.000			
GEAR SPUR - TRAVEL	----	----	----	----	Not applicable
I. D.	5.5095	5.5115			
Jaw I. D.	4.4900	4.4910			
Gear tooth data					
62 teeth 3 D.A. 20.6667 P.D.					
Pressure angle—25°					
Backlash .005°/.000	----	----	----	----	.010
Teeth to measure					
21.6713/21.6614 over .056951 pin dia.					
Bushing					
O. D.	5.512	5.514			
I. D.	3.761	3.763	.008	.010	.015
CLUTCH-SLIDING JAW	----	----	----	----	Not applicable
Minor dia.	3.333	3.337			
Major dia.	3.6667	3.6677	.0037	.0087	.015
3.636 T.I.F. dia.					
3.500 pitch dia.					
SHAFT-TRUCK VERTICAL TRAVEL	----	----	----	----	Not applicable

Table 4-1. Repair and Replacement Standards—Continued.

Component	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Minimum	Maximum	Minimum	Maximum	
Minor dia.	3.8158				
Major dia.	3.9068	3.9180			
P. D.	3.8565	3.8639			
12 thd's. per in.					
INVOLUTE EXTERNAL SPLINE DATA					
Number of teeth—23					
Diametral pitch—6/12					
Pressure angle—30°					
Base Circle dia.—3.3198"					
Max. out of roundness—.0012					
Max. cumulative pitch error (any 2 teeth) .0015					
Max. involute profile error—.0006"					
Max. lead error—.0004"					
INVOLUTE EXTERNAL SPLINE DATA					
Number of teeth—21					
Dia. pitch—6/12					
Pressure angle—30°					
Base circle dia.—3.0311"					
Max. out of roundness—.0012"					
Max. cumulative pitch error (any 2 teeth) .0015"					
Max. lead error—.0004"					
Journal #1	4.0000	4.0015	----	----	Not applicable
Collar 4 1/4" dia.					
Journal #2	3.7523	3.7528	----	----	Not applicable
GEAR - MITER					
Minor dia.	3.6667	3.6702			
Major dia.	4.0000	4.0011			
Pitch dia.	3.833				
T. I. F. dia.	3.969				
Major addendum					
Circle dia.	12.749	12.759			
O. D.	12.367	12.377			
P. D.	12.000				
Number of teeth—18					
Teeth in mate—18					
Dia. pitch—1 1/2					
Pressure angle—20°					
Backlash allowed—.018/.016					
Backlash on mate—.018/.016					
Total B/L allowed on pitch line .036/.032	----	----	----	----	.040
BEARING - BRAKE SHAFT	----	----	----	----	Permanent fit
I. D.	1.5625	1.5639			
BUSHING					
I. D.	1.2544	1.2558	.0054	.0098	.015
RATCHET	----	----	----	----	Sliding fit
Minor dia.	3.6667	3.6702			
Major dia.	4.0000	4.0011	.0015	.0053	.010
Pitch	3.833				
T. I. F. dia.	3.969				
BUSHING					
I. D.	1.760	1.765	.013	.023	.030
O. D.	2.1265	2.1288			
BUSHING					
I. D.	1.760	1.765	.013	.023	.030

Table 4-1. Repair and Replacement Standards—Continued.

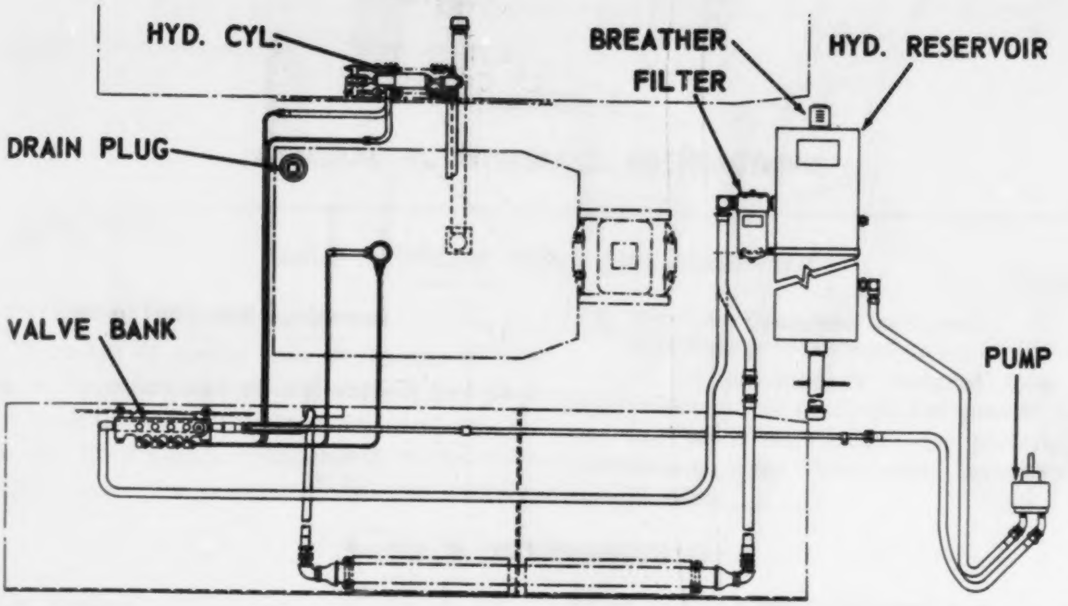
Component	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Minimum	Maximum	Minimum	Maximum	
O. D.	2.1265	2.1280			
ROLLER	----	----	----	----	Not applicable
Left and Right:					
I. D.	2.252	2.256			
Hub bore	2.1250	2.265			
I. D.	2.252	2.256			
BUSHING					
I. D.	1.754	1.756	.007	.010	.020
O. D.	2.1270	2.1285			
BUSHING					
I. D.	.755	.757	.009	.016	.021
BUSHING					
I. D.	1.2544	1.2558	.0054	.0098	.015
O. D.	1.5639	1.5653			
BUSHING					
I. D.	.754	.755	.008	.014	.020
O. D.	.878	.879			
BUSHING					
I. D.	.7495	.7505	.0025	.0045	.009
O. D.	.878	.879			
BUSHING					
I. D.	3.007	+.002 -.000	.005	.011	.020
O. D.	3.502	+.0020 -.0000			
BUSHING, SHEAVE					
Dia. bore	3.2538	3.2567	.0038	.0062	.012
O. D.	3.7519	3.7538			
CLOSURE - BEARING	----	----	----	----	Permanent fit
I. D. Bore	2.5615	2.5630			
O. D.	4.170	4.185			


POWER LOAD LOWERING MASTER CYL.
SWING LEFT MASTER CYL.
MAIN HOIST MASTER CYL.
SEC. HOIST MASTER CYL.
R.H. POWER LOAD LOWERING MASTER CYL.
SWING RIGHT MASTER CYL.
BOOM DOWN MASTER CYL.
RESERVOIR
BOOM UP MASTER CYL.
SELECTOR VALVE
BOOM BRAKE SLAVE CYL.
SELECTOR VALVE
POWER BOOM LOWERING CLUTCH
R.H. POWER LOAD LOWERING CLUTCH
MAIN HOIST SLAVE CYL.
SWING RIGHT SLAVE CYL.
SWING LEFT SLAVE CYL.
SEC. HOIST SLAVE CYL.
POWER LOAD LOWERING SLAVE CYL.

A. MANUAL HYDRAULIC CONTROLS

MEC 3810-287-15/ 4-1(1)

Figure 4-1 (1). Hydraulic system schematic.


HYD. CYL.
BREATHER
HYD. RESERVOIR
FILTER
DRAIN PLUG
VALVE BANK
PUMP

B. CRAWLER HYDRAULICS

MEC 3810-287-15/4-1 (2)

Figure 4-1 (2).—Continued.

CHAPTER 5

GENERAL MAINTENANCE INSTRUCTIONS

Section I. SPECIAL TOOLS AND EQUIPMENT

5–1. Special Tools and Equipment

There are no special tools or equipment required by direct and general support and depot maintenance for performing maintenance on the Thew-Lorain crane-shovel, model L–36M.

5–2. Specially Designed Tools and Equipment

There are no specially designed tools or equipment required by direct and general support and depot maintenance for performing maintenance on the Thew-Lorain crane-shovel, model L–36M.

Section II. TROUBLESHOOTING

5–3. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the Thew-Lorain crane-shovel, model L–36M, or any of its components. Each trouble symptom stated is followed by a list of probable causes. The possible remedy recommended is described opposite the probable cause.

5–4. Engine Hard to Start or Fails to Start

Probable cause	Possible remedy
Injectors worn, clogged or defective	Repair or replace injectors (para 6–5).
Valves burnt or out of adjustment	Adjust, grind or replace valves (para 3–48, 6–14).
Piston rings worn or broken	Replace piston rings (para 6–21).
Fuel transfer pump worn or defective	Repair or replace fuel transfer pump (para 6–4).
Fuel lines bent, kinked, or broken	Replace fuel lines (para 3–55).
Governor defective, worn, or out of adjustment	Repair or replace governor (para 3–50).

5–5. Engine Overheats

Probable cause	Possible remedy
Radiator clogged or leaking	Clean, repair or replace radiator (para 3–56).
Thermostat defective	Replace thermostat (para 3–59).
Radiator core obstructed	Clean radiator core (para 3–56).
Hose collapsed	Replace hose (para 3–56).

5–6. Engine Runs too Cold

Probable cause	Possible remedy
Thermostat stuck in open position	Replace thermostat (para 3–59).
Ambient temperature too cold	Partially cover radiator until normal operating temperature is attained.

5–7. Engine Lacks Power

Probable cause	Possible remedy
Valves worn, burnt or defective	Give engine complete valve job. Replace burnt, worn, or defective valves (para 6–14).

Probable cause	Possible remedy
Injectors clogged, worn, or defective	Repair or replace injectors (para 6-5).
Worn or broken piston rings	Replace rings (para 6-21).
Engine out of time	Retime engine (para 6-26).

5-8. Engine Knocks or Develops Sudden Noise

Probable cause	Possible remedy
Connecting rod bearing burned out	Replace connecting rod bearings (para 6-21).
Engine low on oil	Check oil level and refill as required (para 3-4).
Piston broken	Replace piston assembly (para 6-21).
Improper grade of fuel	Drain fuel system and refill with proper grade fuel (para 3-55).
Rocker arms loose	Adjust rocker arms (para 3-48).

5-9. Engine has Low or no Oil Pressure

Probable cause	Possible remedy
Engine oil level low	Check oil level and fill as required (para 3-4).
Oil pump worn, defective, or damaged	Repair or replace oil pump (para 6-19).
Oil pump inlet screen clogged	Clean or replace oil pump inlet screen (para 6-19).
Main or connecting rod bearings worn or damaged	Replace bearing (para 6-21 and 6-22).
By-pass valve worn or stuck in open position	Replace by-pass valve (para 6-19).

5-10. Engine Oil Consumption High

Probable cause	Possible remedy
Improper grade oil	Drain and refill with proper grade oil (para 3-4).
Worn piston rings	Replace piston rings (para 6-21).
Pan gaskets leaking	Replace pan gaskets (para 6-18).
Valve cover gasket leaking	Replace valve cover gasket (para 3-47).

5-11. Engine Exhaust Smoke Excessive

Probable cause	Possible remedy
Worn or broken piston rings	Replace piston rings (para 6-21).
Injectors faulty or improperly adjusted	Repair, replace, and adjust injectors (para 6-5).
Improper grade fuel	Drain fuel system and refill with proper grade fuel (para 3-9).

5-12. Starter Fails to Crank Engine

Probable cause	Possible remedy
Batteries discharged or defective	Recharge batteries. Replace defective batteries (para 3-20).
Starter switch defective	Replace starter switch (para 3-66).
Starting motor worn or defective	Repair or replace starting motor (para 3-65).

5-13. Battery-Charging Ammeter Indicates Low or no Charging Rate when Batteries are Low or Discharged.

Probable cause	Possible remedy
Alternator belts worn or slipping	Replace and adjust alternator belt (para 3-62 and 3-11).
Alternator defective	Replace alternator (para 3-63).

5-14. Hoist Brakes will not Hold Load

Probable cause	Possible remedy
Brake bands improperly adjusted	Adjust brakes (para 3-15).
Brake lining worn	Replace brake lining (para 3-100).
Brake pedal linkage improperly adjusted	Adjust brake pedal linkage (para 3-100).
Oil on brake lining	Remove and clean lining (para 3-100). Replace badly saturated lining.

5–15. Hoist Clutches will not Raise Load

Probable cause	Possible remedy
Clutch shoes improperly adjusted	Adjust clutch shoes (para 3–13).
Clutch lining worn, defective or damaged	Replace lining (para 3–98).
Oil or grease on clutch lining	Remove and clean lining (para 3–98). Replace badly saturated lining.

5–16. Boom Hoist Brake Slips

Probable cause	Possible remedy
Brake improperly adjusted	Adjust brake (para 3–15).
Lining worn or damaged	Replace lining (para 3–100).
Brake spring weak or broken	Replace brake spring (para 3–100).
Grease or oil on lining	Remove and clean lining (para 3–100). Replace badly saturated lining.

5–17. Swing Clutches Slip

Probable cause	Possible remedy
Clutch shoes improperly adjusted	Adjust clutch shoes (para 3–13).
Clutch lining worn or damaged	Replace clutch lining (para 3–98).
Grease or oil on lining	Remove and clean lining (para 3–98). Replace badly saturated lining.

5–18. Crawler Belts Jump Drive Sprockets

Probable cause	Possible remedy
Crawler belts worn excessively	Replace crawler belts (para 3–107).
Drive sprockets worn excessively	Replace drive sprockets (para 8–4).
Crawler belts improperly adjusted	Adjust crawler belts (para 3–22).
Drive sprocket or idler roller bearings worn or damaged	Replace bearings (para 8–4 and 8–5).

5–19. Crawler Does not Steer Straight

Probable cause	Possible remedy
Crawler belts improperly adjusted	Adjust crawler belts (para 3–22).
Idler roller bearings worn or damaged	Replace bearings (para 8–5).

Section III. RADIO INTERFERENCE SUPPRESSION

5–20. General

Refer to TM 11–483 for definitions, purposes, source and methods used to obtain proper radio suppression.

5–21. Interference Suppression Components

Refer to paragraph 3–44 for interference suppression components.

5–22. Replacement of Suppression Components

Refer to paragraph 3–45 for replacement of suppression components.

Section IV. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS

5–23. General

This section covers the removal and installation of the cab, engine, transmission, clutch shaft assembly, hoist shaft assembly, power boom lowering assembly, power load lowering assembly, reversing shaft assembly, third drum, turntable bed, crawler frame assembly, and vertical travel shaft assembly.

5-24. Cab Assembly

a. Removal. Refer to figure 5-1 and remove the cab assembly.

b. Installation. Refer to figure 5-1 and install the cab assembly.

5-25. Engine Transmission

a. Removal.

(1) Refer to paragraph 3-108 and remove the chain case and engine drive chain assemblies.

(2) Refer to paragraph 3-83 and remove the rear cab panels.

(3) Refer to figure 5-2 and remove engine transmission.

b. Installation.

(1) Refer to figure 5-2 and install the engine transmission.

(2) Refer to paragraph 3-83 and install the rear cab panels.

(3) Refer to paragraph 3-108 and install the drive chain and chain case assemblies.

5-26. Engine Assembly

a. Removal.

(1) Refer to paragraph 3-83 and remove the rear cab panels.

(2) Refer to paragraph 3-108 and remove the chain case and engine drive chain assemblies.

(3) Refer to figure 5-3 and remove the engine assembly.

b. Installation.

(1) Refer to figure 5-3 and install the engine assembly.

(2) Refer to paragraph 3-108 and install the engine drive chain and chain case assemblies.

(3) Refer to paragraph 3-83 and install the rear cab panels.

5-27. Power Boom Lowering Assembly

a. Removal.

(1) Refer to paragraph 3-104 and remove the guards from the power boom lowering assembly.

(2) Refer to figure 5-4 and remove the power boom lowering assembly.

b. Installation.

(1) Refer to figure 5-4 and install the power boom lowering assembly.

(2) Refer to paragraph 3-104 and install the guards on the power boom lowering assembly.

5-28. Power Load Lowering Assembly

a. Removal.

(1) Refer to paragraph 3-104 and remove the power load lowering guards.

(2) Refer to figure 5-5 and remove the power load lowering assembly.

b. Installation.

(1) Refer to figure 5-5 and install the power load lowering assembly.

(2) Refer to paragraph 3-104 and install the power load lowering guards.

5-29. Reversing Shaft Assembly

a. Removal. Refer to figure 5-6 and remove the reversing shaft assembly.

b. Installation. Refer to figure 5-6 and install the reversing shaft assembly.

5-30. Third Drum Assembly

a. Removal. Refer to figure 5-7 and remove the third drum assembly.

b. Installation. Refer to figure 5-7 and install the third drum assembly.

5-31. Hoist Shaft Assembly

a. Removal.

(1) Refer to paragraph 3-83 and remove the front cab panels.

(2) Refer to paragraph 3-108 and remove the hoist drive chains.

(3) Refer to figure 5-8 and remove the hoist shaft assembly.

b. Installation.

(1) Refer to figure 5-8 and install the hoist shaft assembly.

(2) Refer to paragraph 7-2 and install the hoist shaft assembly.

(3) Refer to paragraph 3-83 and install the front cab panels.

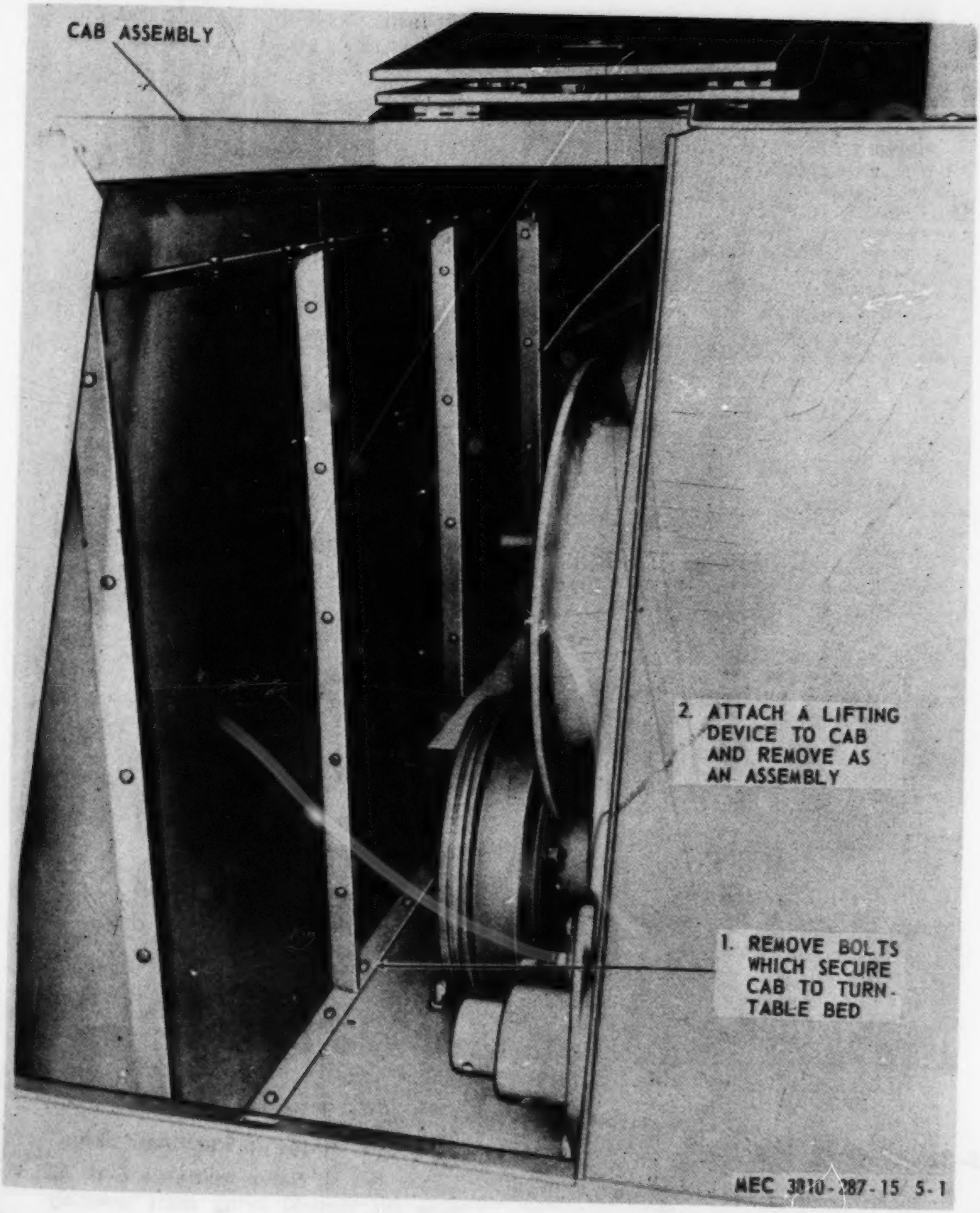

CAB ASSEMBLY
2. ATTACH A LIFTING DEVICE TO CAB AND REMOVE AS AN ASSEMBLY
1. REMOVE BOLTS WHICH SECURE CAB TO TURNTABLE BED
MEC 3810-287-15 5-1

Figure 5-1. Cab assembly, removal and installation.

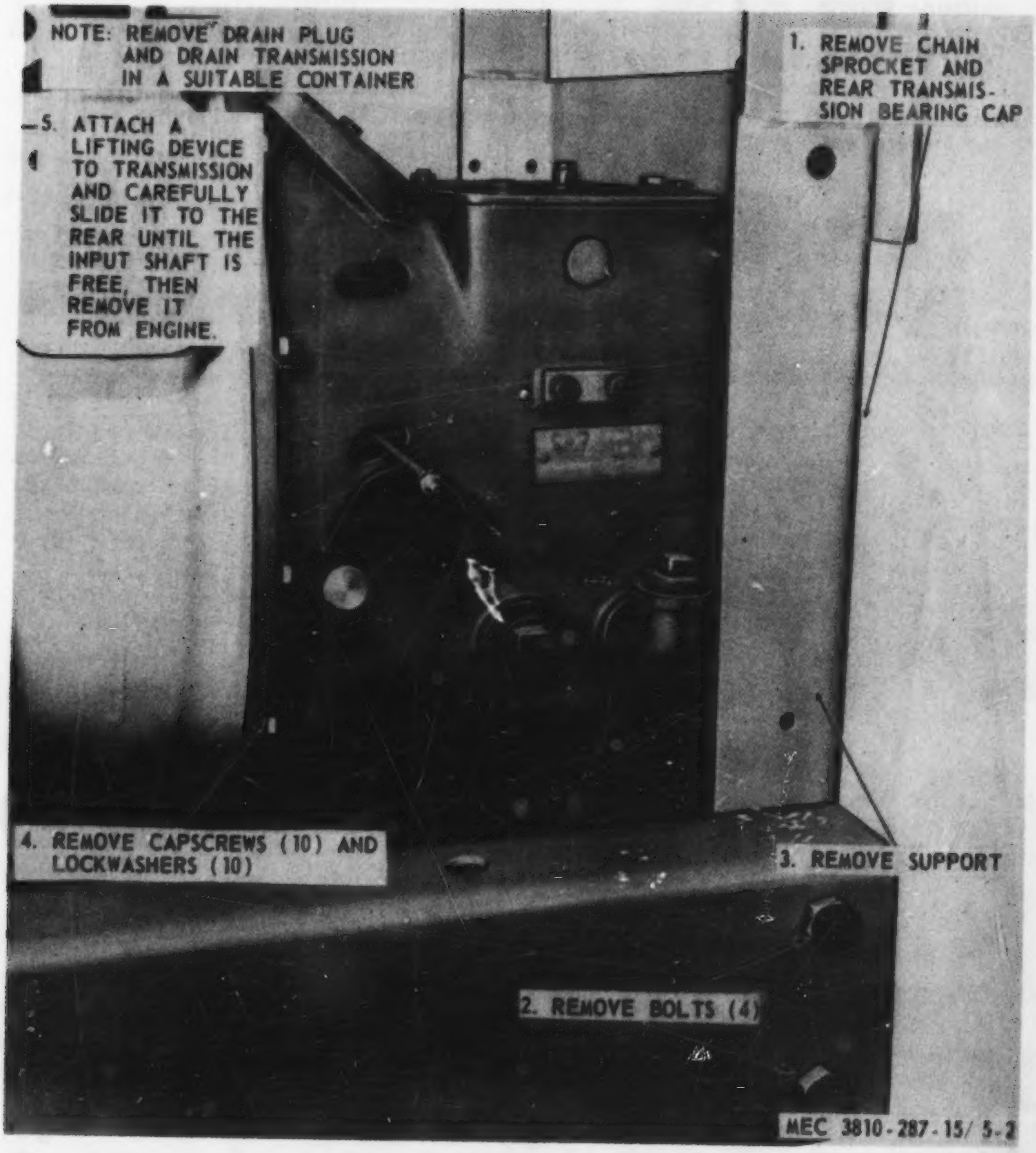

NOTE: REMOVE DRAIN PLUG AND DRAIN TRANSMISSION IN A SUITABLE CONTAINER
1. REMOVE CHAIN SPROCKET AND REAR TRANSMISSION BEARING CAP
5. ATTACH A LIFTING DEVICE TO TRANSMISSION AND CAREFULLY SLIDE IT TO THE REAR UNTIL THE INPUT SHAFT IS FREE, THEN REMOVE IT FROM ENGINE.
4. REMOVE CAPSCREWS (10) AND LOCKWASHERS (10)
3. REMOVE SUPPORT
2. REMOVE BOLTS (4)
MEC 3810-287-15/ 5-2

Figure 5-2. Engine transmission removal and installation.

5-32. Clutch Shaft Assembly

a. Removal. Refer to figure 5-9 and remove the clutch shaft assembly.

b. Installation. Refer to figure 5-9 and install the clutch shaft assembly.

5-33. Vertical Swing Shaft Assembly

a. Removal. Refer to figure 5-10 and remove the vertical swing shaft assembly.

b. Installation. Refer to figure 5-10 and install the vertical swing shaft assembly.

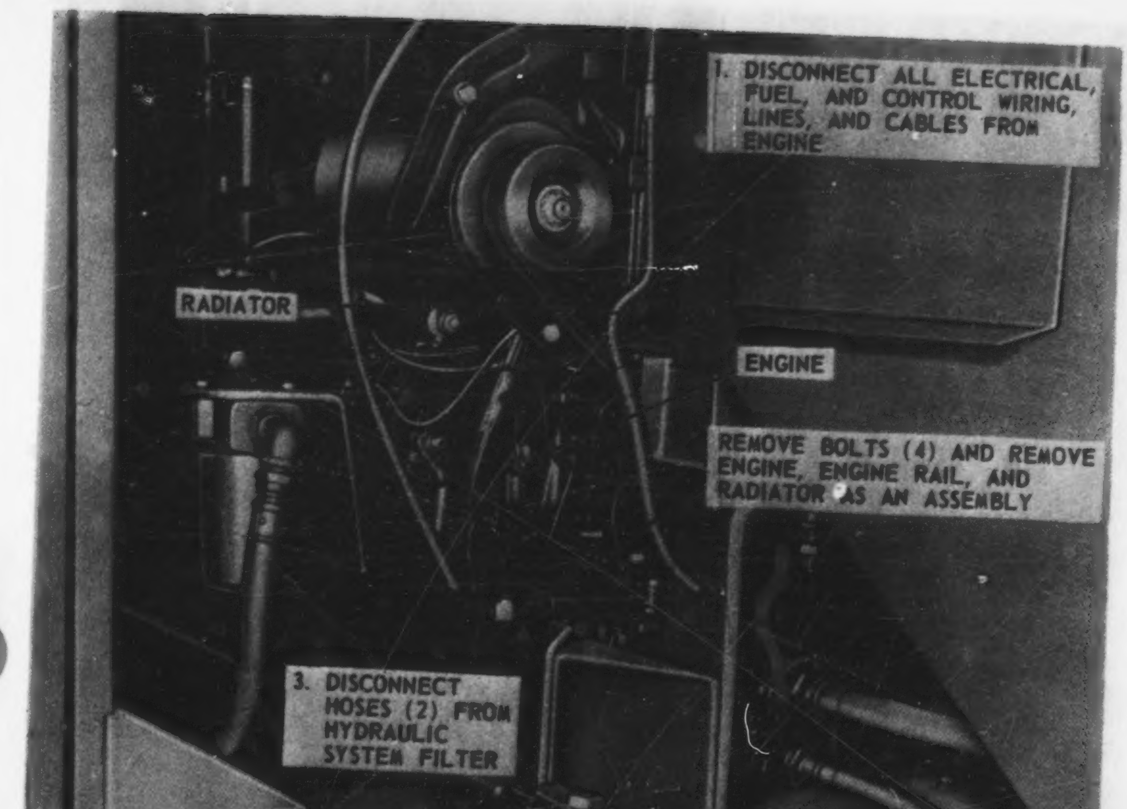

1. DISCONNECT ALL ELECTRICAL, FUEL, AND CONTROL WIRING, LINES, AND CABLES FROM ENGINE
RADIATOR
ENGINE
REMOVE BOLTS (4) AND REMOVE ENGINE, ENGINE RAIL, AND RADIATOR AS AN ASSEMBLY
3. DISCONNECT HOSES (2) FROM HYDRAULIC SYSTEM FILTER
ENGINE RAIL
2. DISCONNECT HOSES (2) FROM HYDRAULIC PUMP
MEC 3810-287-15/ 5-3

Figure 5-3. Engine assembly, removal and installation.

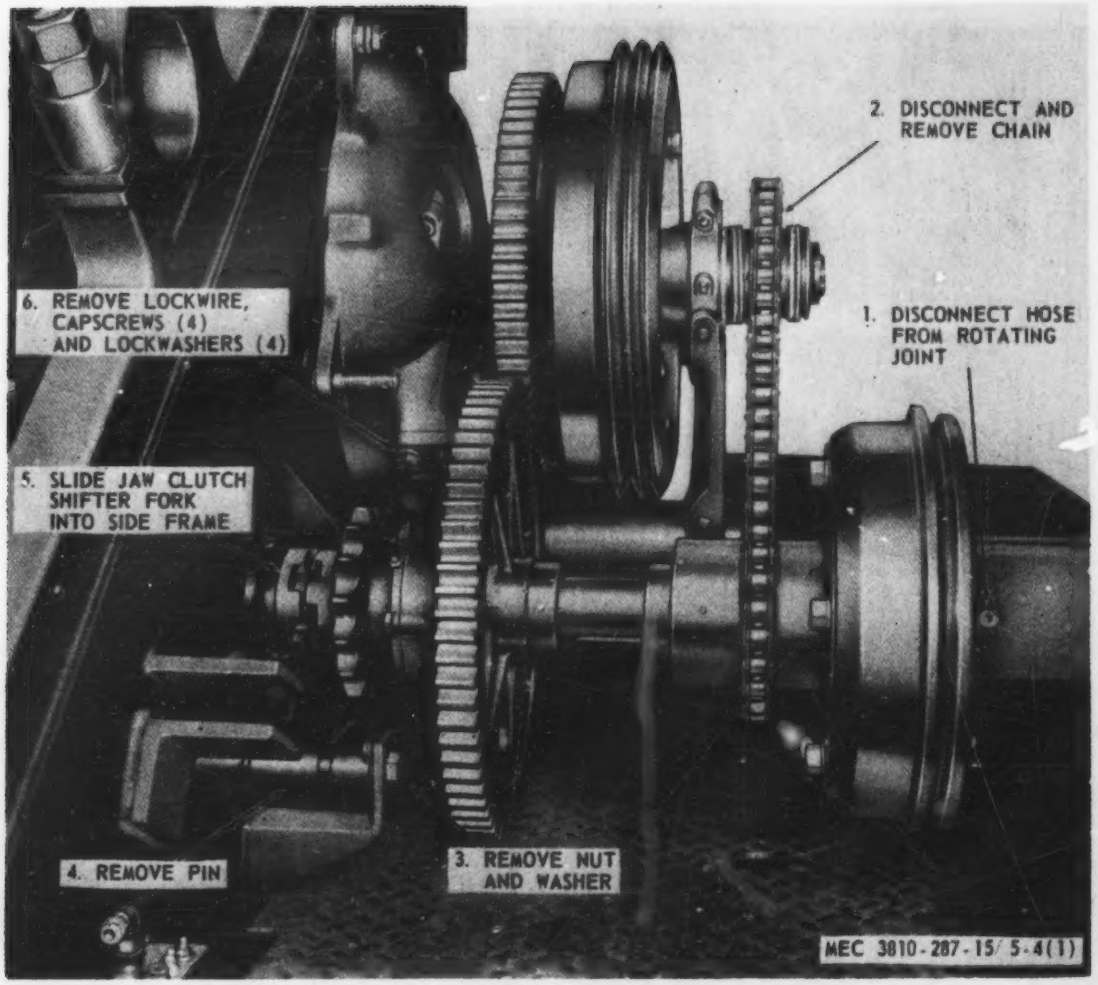

2. DISCONNECT AND REMOVE CHAIN
6. REMOVE LOCKWIRE, CAPSCREWS (4) AND LOCKWASHERS (4)
1. DISCONNECT HOSE FROM ROTATING JOINT
5. SLIDE JAW CLUTCH SHIFTER FORK INTO SIDE FRAME
4. REMOVE PIN
3. REMOVE NUT AND WASHER
MEC 3810-287-15/5-4(1)

Figure 5-4 (1). Power boom lowering assembly, removal and installation.

5-34. Turntable Bed

a. Removal.

(1) Remove the front end attachment (para 2-5 through 2-12).

(2) Remove the center journal rotating joint (para 8-8).

(3) Remove the counterweight (para 7-30).

(4) Remove the snap ring from top of vertical travel shaft (para 8-13).

(5) Remove the shearball mounting clamps (para 7-24).

(6) Refer to paragraph 2-1 and attach a suitable lifting device to turntable bed.

Note. Lift turntable straight up until it is clear of the vertical travel shaft. Turntable must be level to prevent damage to shaft and bushings.

b. Installation.

(1) Refer to paragraph 2-1 and attach a suitable lifting device to turntable bed.

Note. Lifting device must be attached in a manner which will maintain the turntable bed level while lifting.

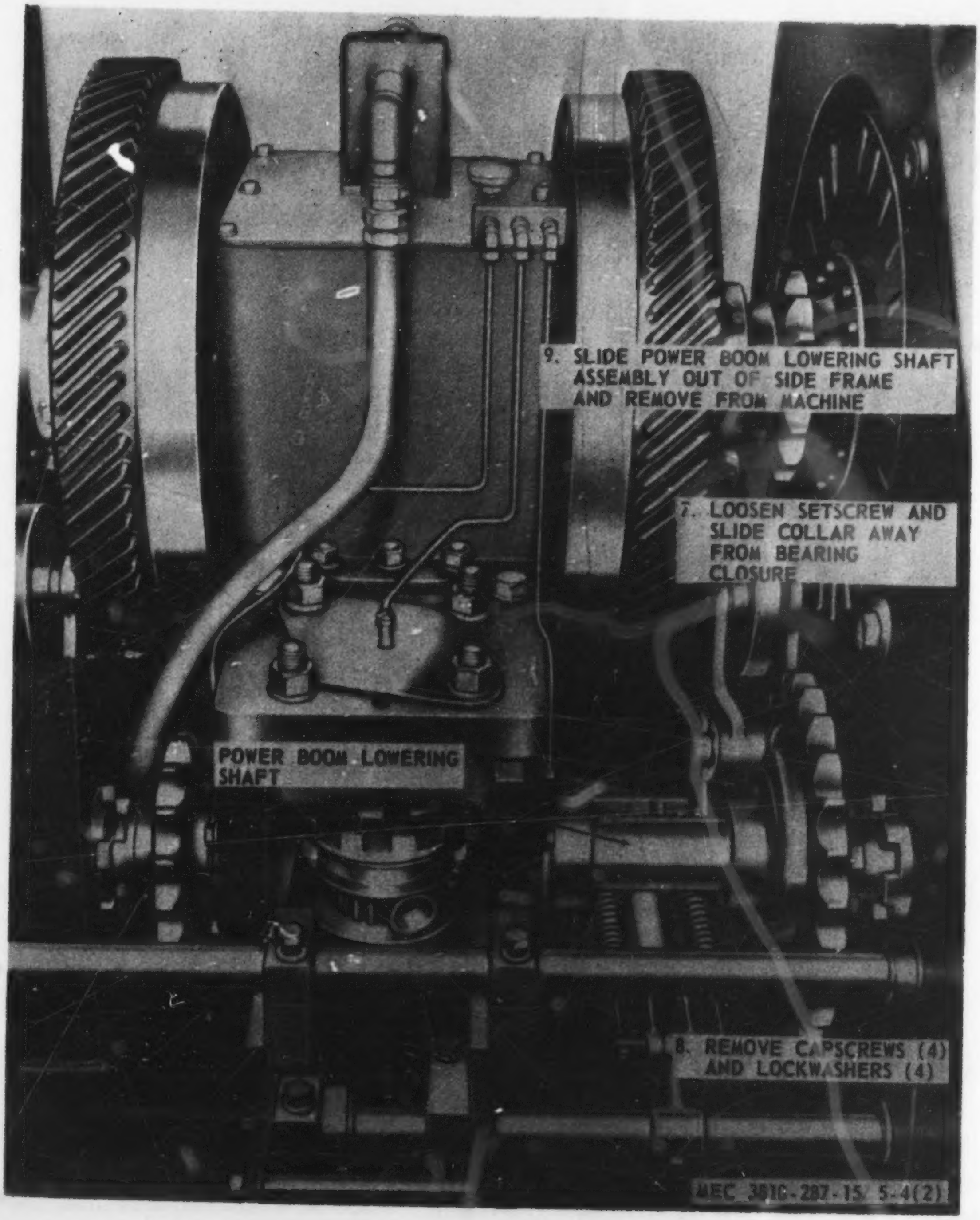

9. SLIDE POWER BOOM LOWERING SHAFT ASSEMBLY OUT OF SIDE FRAME AND REMOVE FROM MACHINE
7. LOOSEN SETSCREW AND SLIDE COLLAR AWAY FROM BEARING CLOSURE
POWER BOOM LOWERING SHAFT
8. REMOVE CAPSCREWS (4) AND LOCKWASHERS (4)
MEC 3810-287-15/5-4(2)

Figure 5-4 (2).—Continued.

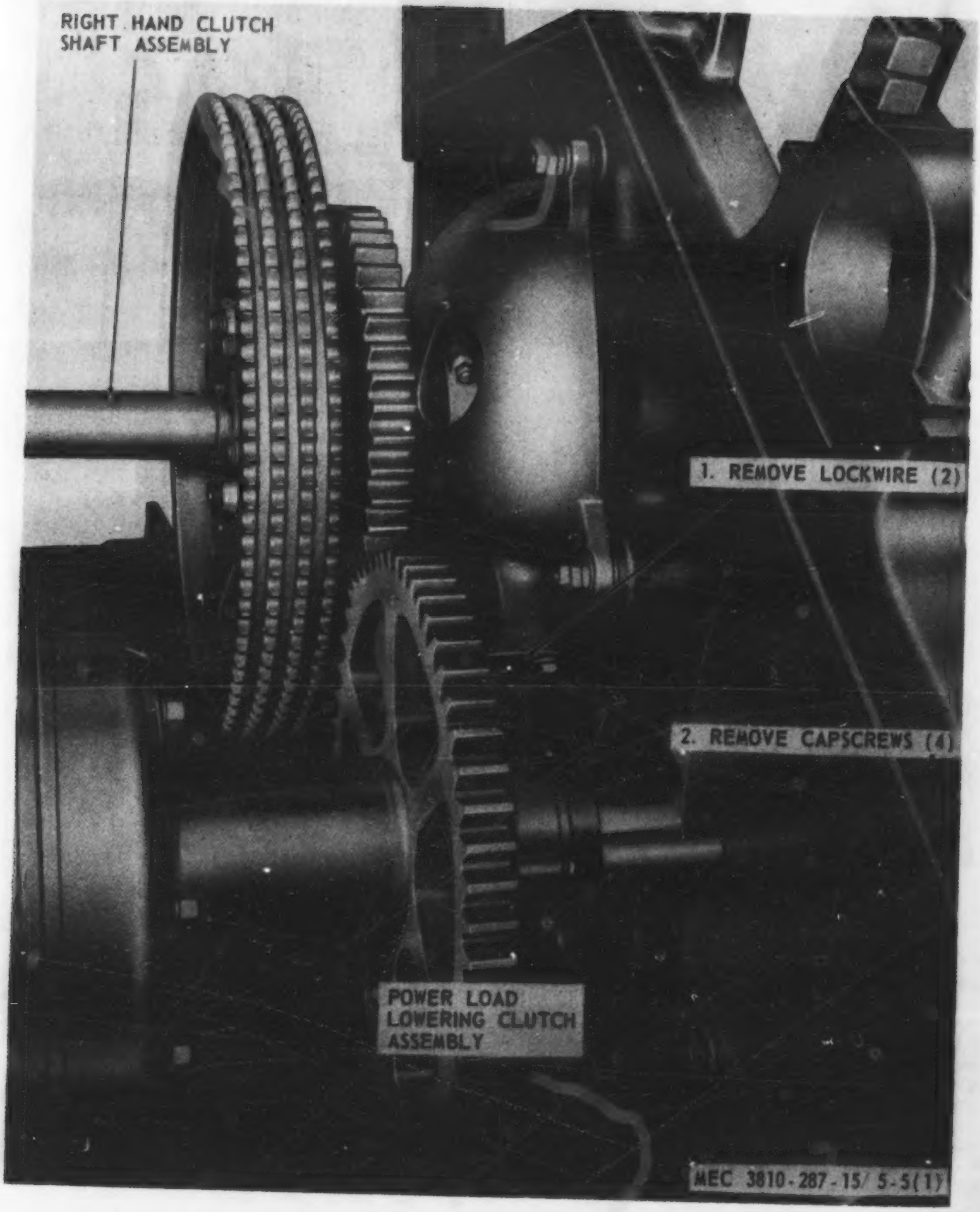
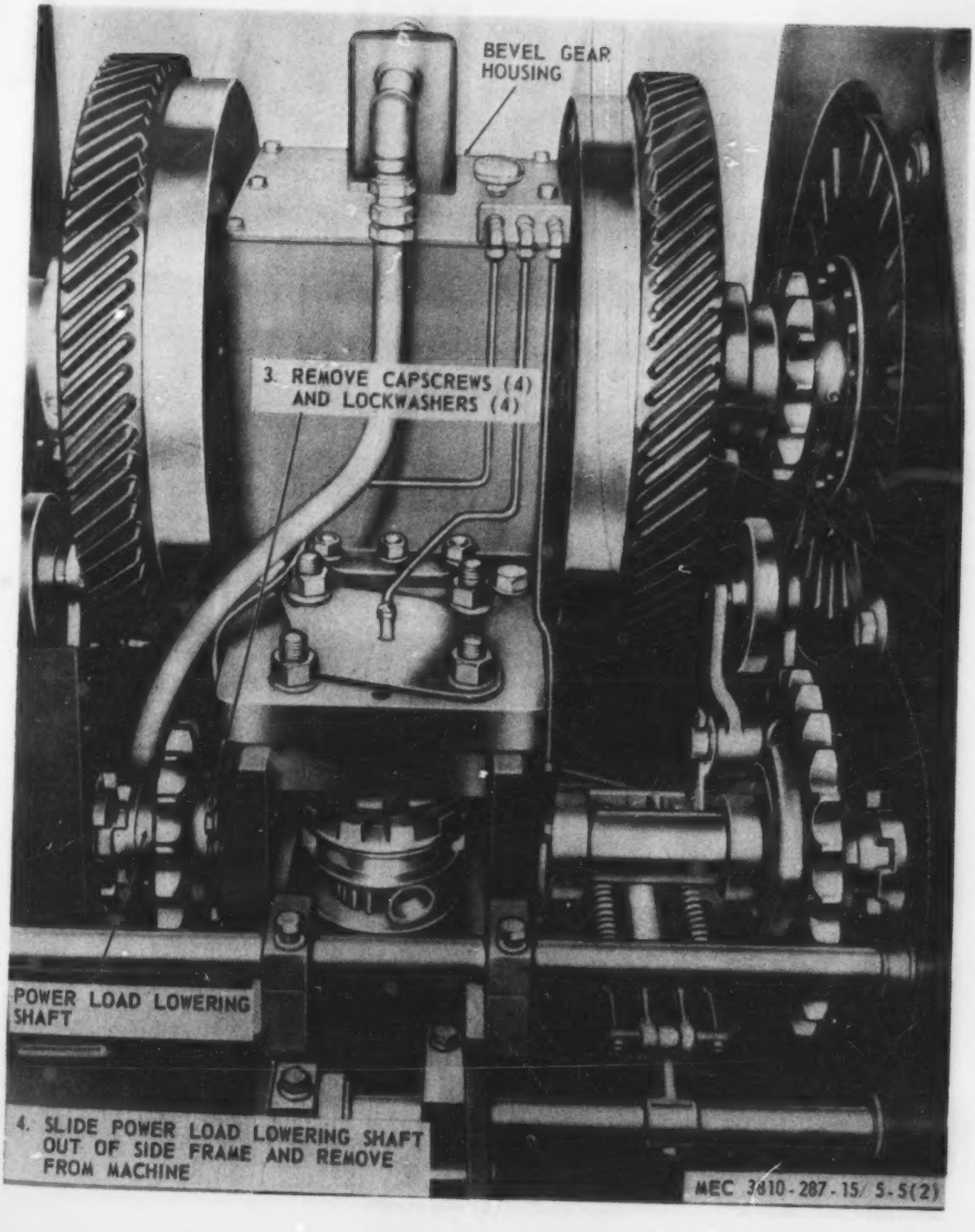

RIGHT HAND CLUTCH SHAFT ASSEMBLY
1. REMOVE LOCKWIRE (2)
2. REMOVE CAPSCREWS (4)
POWER LOAD LOWERING CLUTCH ASSEMBLY
MEC 3810-287-15/ 5-5(1)

Figure 5-5 (1). Power load lowering assembly, removal and installation.


BEVEL GEAR HOUSING
POWER LOAD LOWERING SHAFT
MEC 3810-287-15/ 5-5(2)

3. REMOVE CAPSCREWS (4) AND LOCKWASHERS (4)

4. SLIDE POWER LOAD LOWERING SHAFT OUT OF SIDE FRAME AND REMOVE FROM MACHINE

Figure 5-5 (2).—Continued.

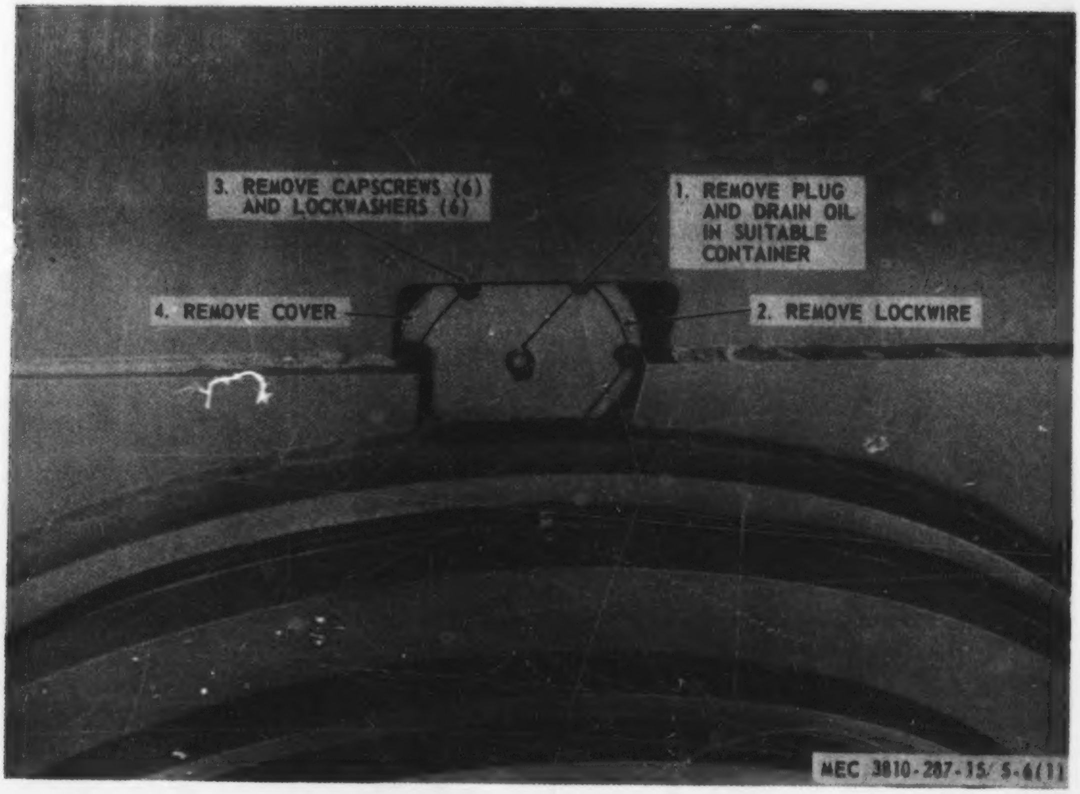

3. REMOVE CAPSCREWS (6) AND LOCKWASHERS (6)
1. REMOVE PLUG AND DRAIN OIL IN SUITABLE CONTAINER
4. REMOVE COVER
2. REMOVE LOCKWIRE
MEC 3810-287-15/ 5-6(1)

Figure 5-6 (1). Reversing shaft assembly, removal and installation.

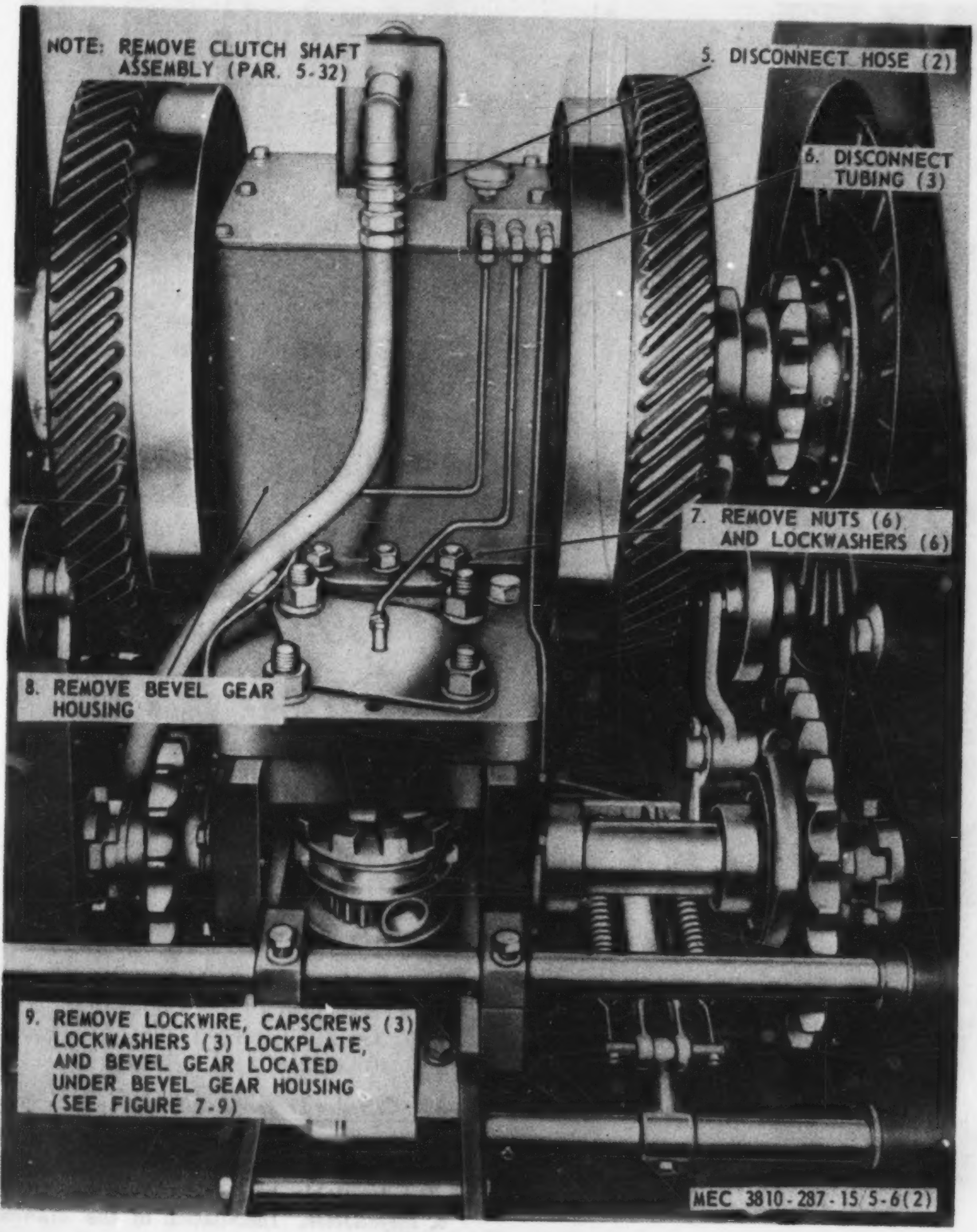

NOTE: REMOVE CLUTCH SHAFT ASSEMBLY (PAR. 5-32)
5. DISCONNECT HOSE (2)
6. DISCONNECT TUBING (3)
7. REMOVE NUTS (6) AND LOCKWASHERS (6)
8. REMOVE BEVEL GEAR HOUSING
9. REMOVE LOCKWIRE, CAPSCREWS (3) LOCKWASHERS (3) LOCKPLATE, AND BEVEL GEAR LOCATED UNDER BEVEL GEAR HOUSING (SEE FIGURE 7-9)
MEC 3810-287-15/5-6(2)

Figure 5-6 (2).—Continued.

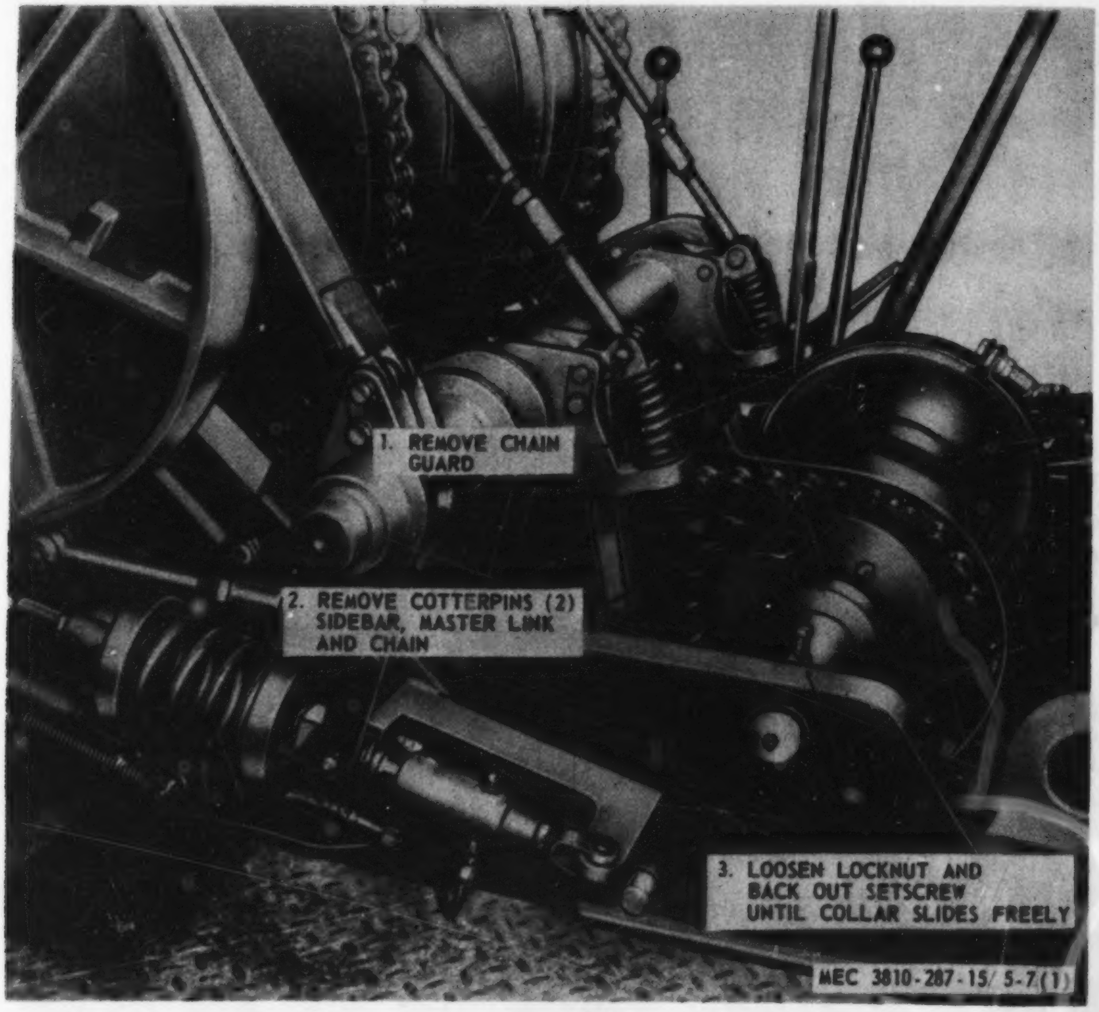

1. REMOVE CHAIN GUARD
2. REMOVE COTTERPINS (2) SIDEBAR, MASTER LINK AND CHAIN
3. LOOSEN LOCKNUT AND BACK OUT SETSCREW UNTIL COLLAR SLIDES FREELY
MEC 3810-287-15/ 5-7(1)

Figure 5-7 (1). Third drum assembly, removal and installation.

(2) Pick up the turntable bed and position it over the crawler assembly. Lower the turntable carefully over the vertical travel shaft and install the shearball mounting clamps (para 7-24).

(3) Install the snapring on top of the vertical travel shaft (para 8-13).

(4) Install the center journal rotating joint (para 8-8).

(5) Install the counterweight (para 7-30).

(6) Install the front end attachment (para 2-5 through 2-12).

5-35. Crawler Frame Assembly

a. Removal. Removal of the crawler frame assembly is accomplished in the same manner as the turntable bed (para 5-34).

b. Installation. Installation of the crawler frame assembly is accomplished in the same manner as the turntable bed (para 5-34).

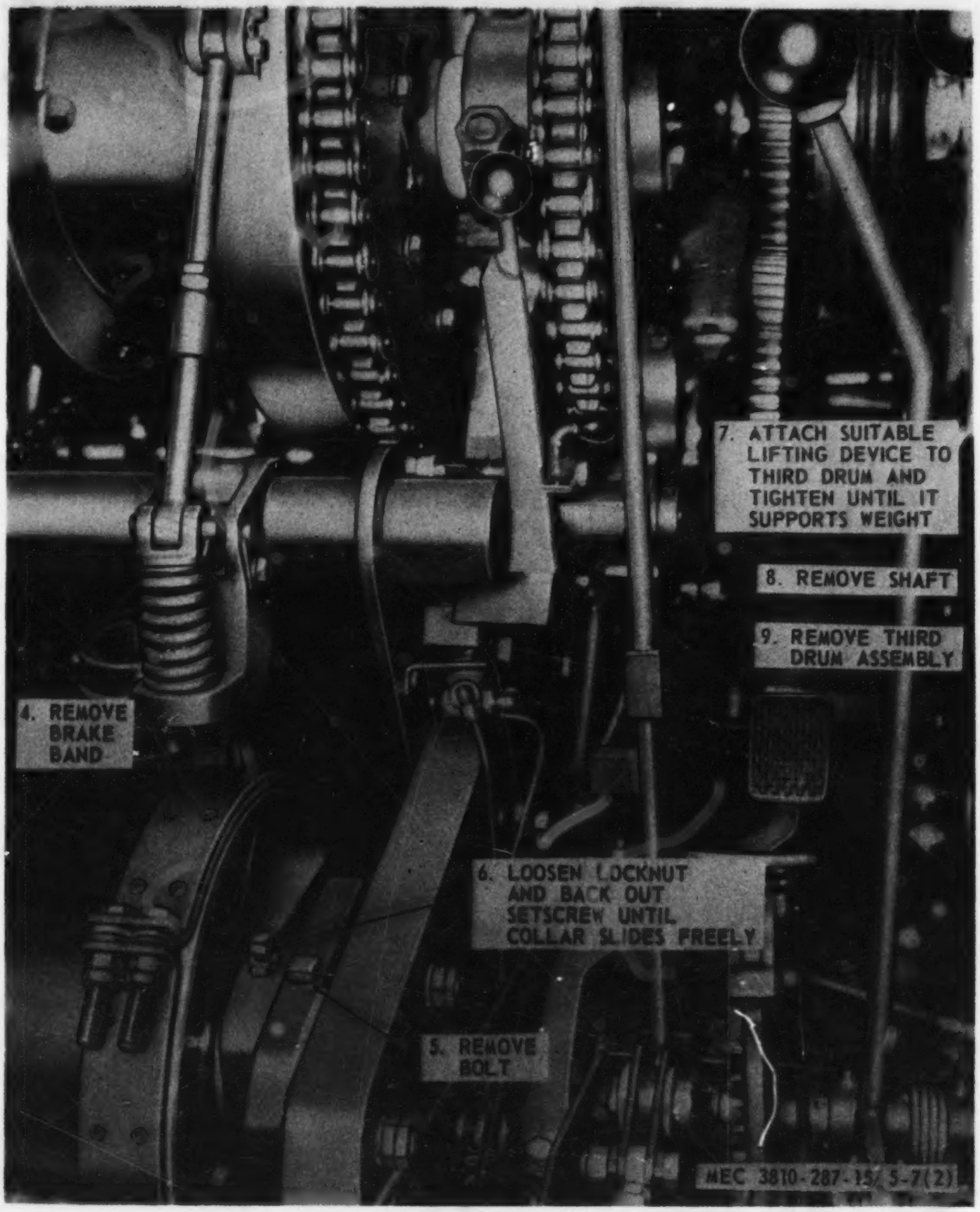

7. ATTACH SUITABLE LIFTING DEVICE TO THIRD DRUM AND TIGHTEN UNTIL IT SUPPORTS WEIGHT
8. REMOVE SHAFT
9. REMOVE THIRD DRUM ASSEMBLY
4. REMOVE BRAKE BAND
6. LOOSEN LOCKNUT AND BACK OUT SETSCREW UNTIL COLLAR SLIDES FREELY
5. REMOVE BOLT
MEC 3810-287-15/5-7(2)

Figure 5-7 (2).—Continued.

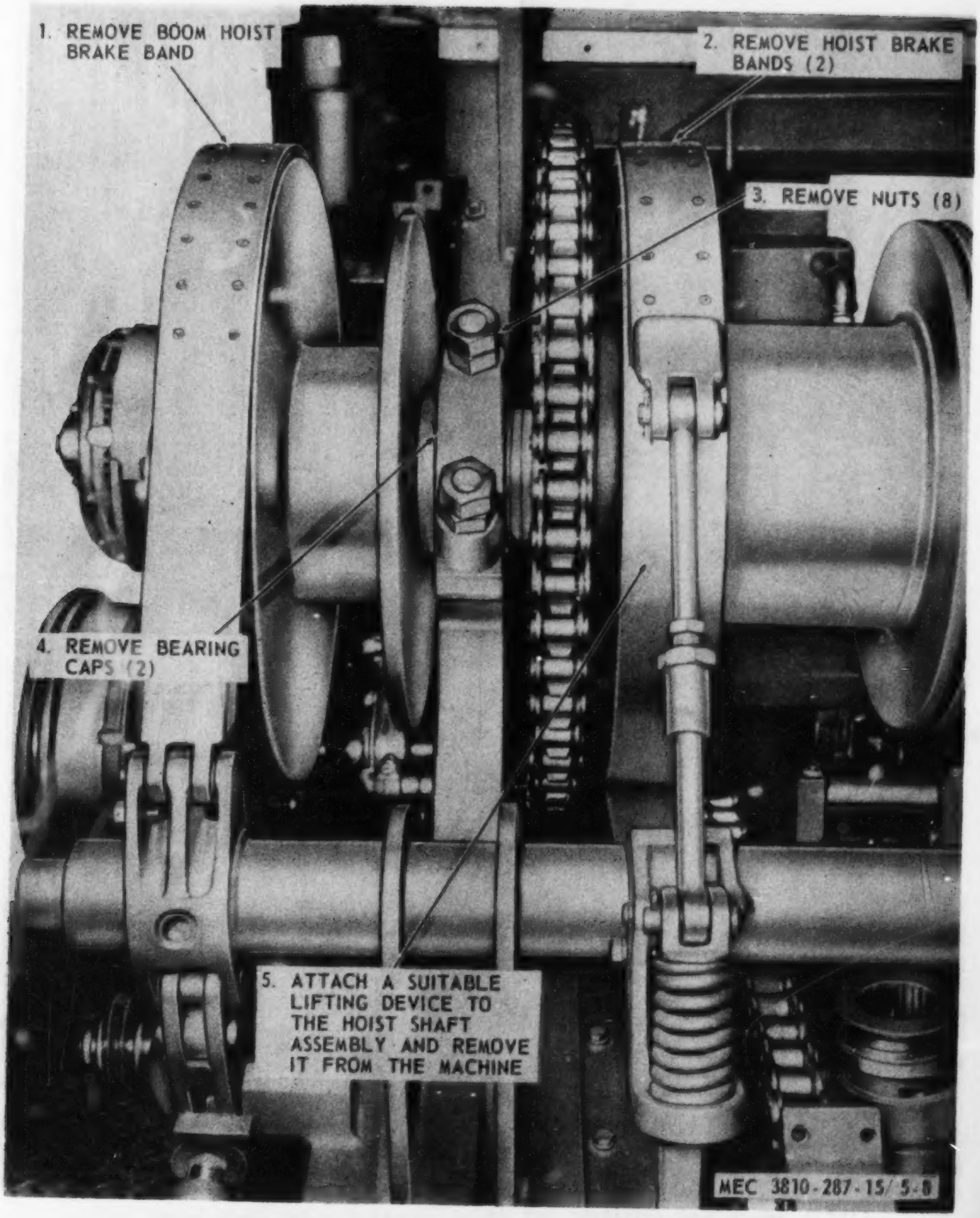

1. REMOVE BOOM HOIST BRAKE BAND
2. REMOVE HOIST BRAKE BANDS (2)
3. REMOVE NUTS (8)
4. REMOVE BEARING CAPS (2)
5. ATTACH A SUITABLE LIFTING DEVICE TO THE HOIST SHAFT ASSEMBLY AND REMOVE IT FROM THE MACHINE
MEC 3810-287-15/5-8

Figure 5-8. Hoist shaft assembly, removal and installation.

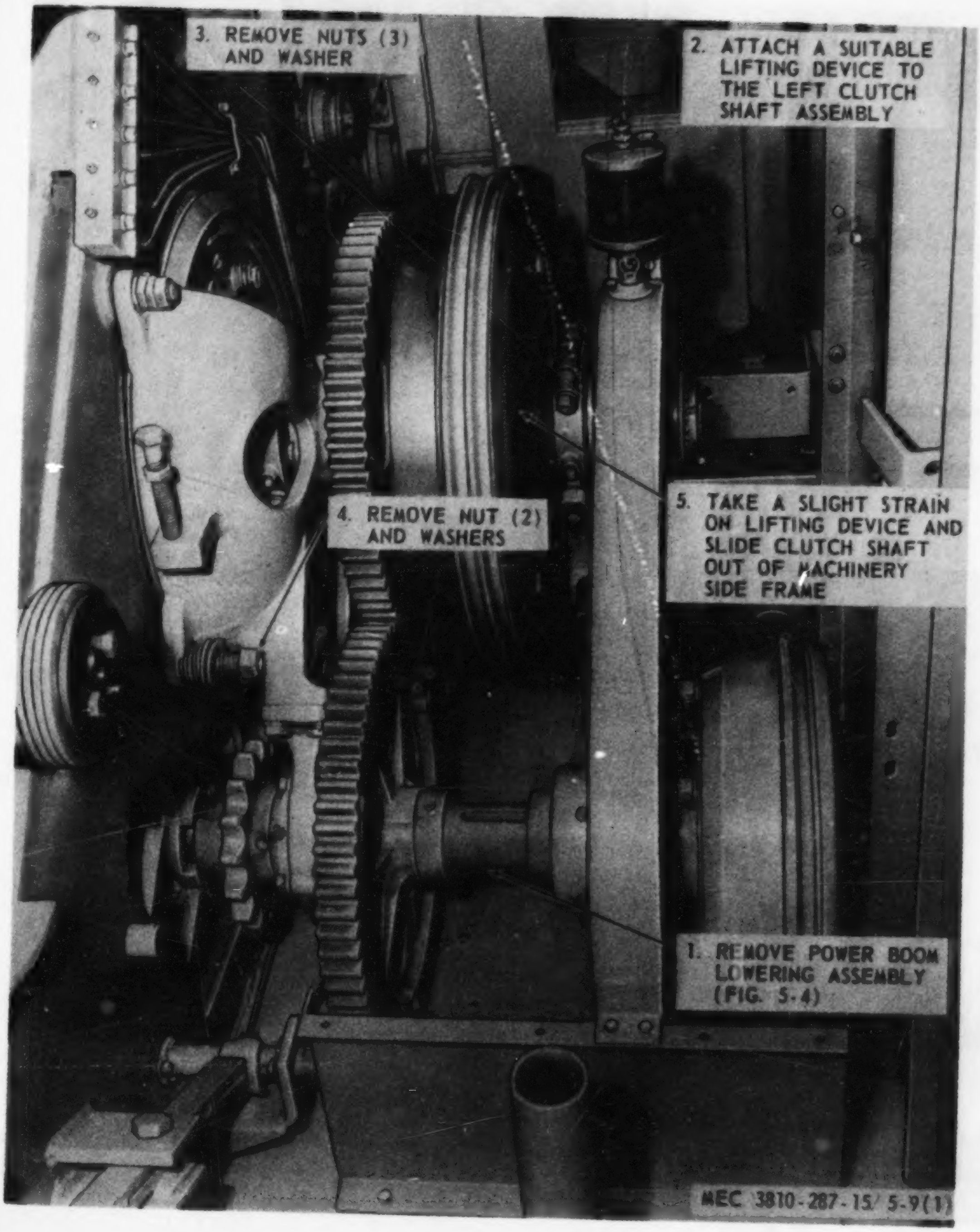

3. REMOVE NUTS (3) AND WASHER
2. ATTACH A SUITABLE LIFTING DEVICE TO THE LEFT CLUTCH SHAFT ASSEMBLY
4. REMOVE NUT (2) AND WASHERS
5. TAKE A SLIGHT STRAIN ON LIFTING DEVICE AND SLIDE CLUTCH SHAFT OUT OF MACHINERY SIDE FRAME
1. REMOVE POWER BOOM LOWERING ASSEMBLY (FIG. 5-4)
MEC 3810-287-15/5-9(1)

Figure 5-9 (1). Clutch shaft assembly, removal and installation.

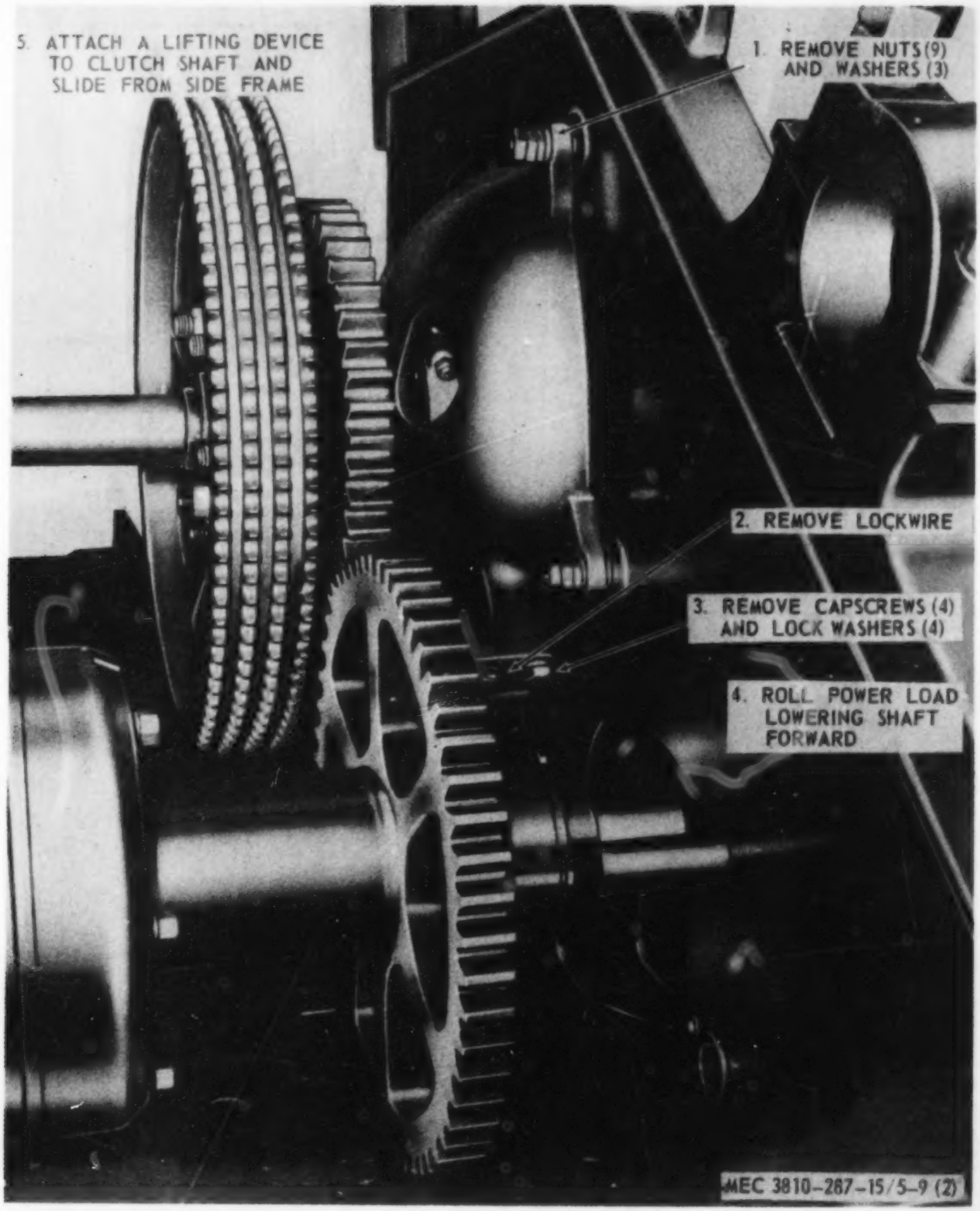

5. ATTACH A LIFTING DEVICE TO CLUTCH SHAFT AND SLIDE FROM SIDE FRAME
1. REMOVE NUTS (9) AND WASHERS (3)
2. REMOVE LOCKWIRE
3. REMOVE CAPSCREWS (4) AND LOCK WASHERS (4)
4. ROLL POWER LOAD LOWERING SHAFT FORWARD
MEC 3810-287-15/5-9 (2)

Figure 5-9 (2).—Continued.

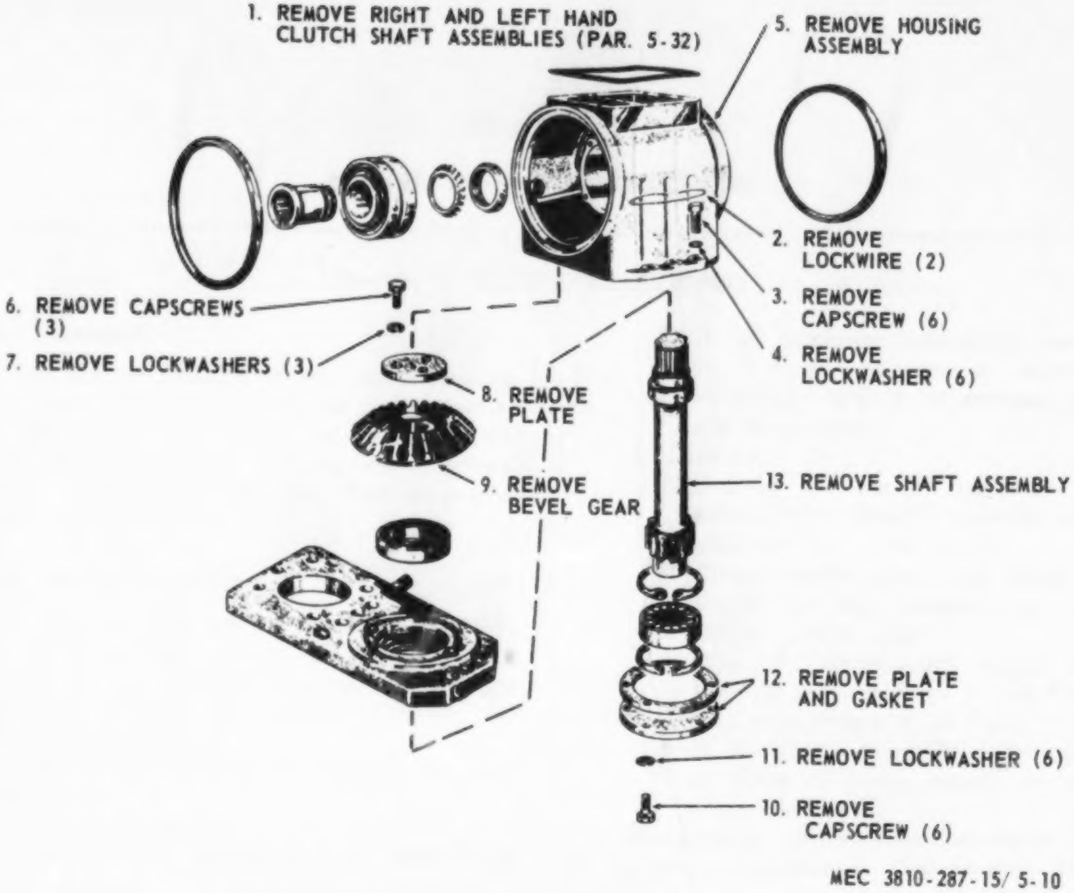

1. REMOVE RIGHT AND LEFT HAND CLUTCH SHAFT ASSEMBLIES (PAR. 5-32)
5. REMOVE HOUSING ASSEMBLY
2. REMOVE LOCKWIRE (2)
3. REMOVE CAPSCREW (6)
4. REMOVE LOCKWASHER (6)
6. REMOVE CAPSCREWS (3)
7. REMOVE LOCKWASHERS (3)
8. REMOVE PLATE
9. REMOVE BEVEL GEAR
13. REMOVE SHAFT ASSEMBLY
12. REMOVE PLATE AND GASKET
11. REMOVE LOCKWASHER (6)
10. REMOVE CAPSCREW (6)
MEC 3810-287-15/ 5-10

Figure 5-10. Vertical swing shaft assembly, removal and installation.

CHAPTER 6

ENGINE REPAIR INSTRUCTIONS

Section I. ENGINE ACCESSORIES

6-1. General

This section contains repair instructions on the items which are considered as accessories to the engine. They consist of the starter, alternator, fuel transfer pump, fuel injectors, water pump, governor, and blower assemblies.

6-2. Starter Assembly

a. General. The starter assembly is located on the lower right side of the engine and attached to the flywheel housing. The starter assembly provides the cranking power for starting the engine.

b. Removal. Remove the starter assembly (para 3-65).

c. Bench Testing.

(1) *No-load amperage and speed test.*

(*a*) Connect a 24 volt battery, an ammeter of approximately 100 ampere capacity, a voltmeter and tachometer as illustrated on figure 6-1.

(*b*) Energize the solenoid by connecting a jumper lead from the solenoid battery terminal to the solenoid switch terminal. Observe the r.p.m. reading. Correct reading is between 7000 minimum to 10,700 maximum. Correct voltage reading is 23 volts, amperage is 60 minimum—90 maximum.

(*c*) If the r.p.m. reading is below 7000, it is an indication of worn or dry bearings or high resistance connections. Repair or replace the starter assembly.

(*d*) If the amperage reading is above 90, it is an indication of shorted windings. Repair or replace the starter assembly.

(2) *Lock test.*

(*a*) Connect the starter terminal in series with a battery, rheostat, and ammeter, in a test circuit.

(*b*) Clamp starter down and mount a torque arm and tension gage on starter pinion gear.

(*c*) Close the circuit and adjust the rheostat for a voltage of 3.5. Correct stall torque is 26 ft.-lb.

(*d*) If the starter assembly stall torque is below 26 ft.-lb., repair or replace the starter.

d. Disassembly. Disassemble the starter in the numerical sequence as illustrated on figure 6-2.

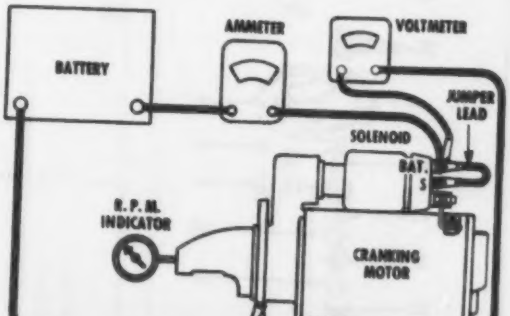
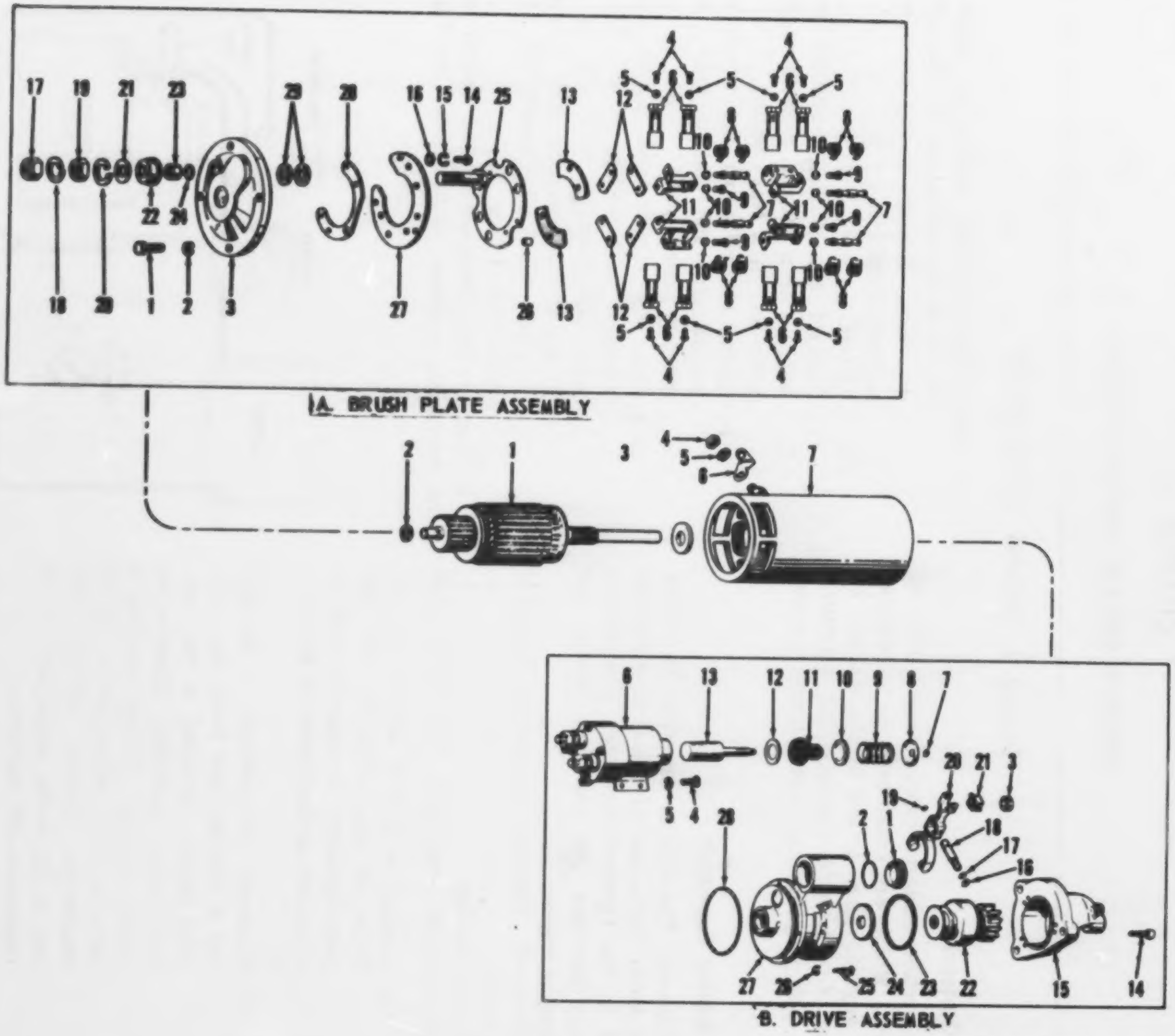


Figure 6-1. Circuit for testing motor free speed.


A. BRUSH PLATE ASSEMBLY
B. DRIVE ASSEMBLY
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29

MEC 3810-287-15/6-2

Figure 6–8. Starter assembly, exploded view.

1 Screw, cap (4)
2 Washer, lock (4)
3 End frame
4 Screw, brush lead attaching (8)
5 Washer, lock (8)
6 Brush (8)
7 Screw, special (4)
8 Spring, brush (8)
9 Screw, brush holder (4)
10 Washer, lock (8)
11 Holder, brush (4)
12 Plate, spacer
13 Insulator, brush holder (2)
14 Screw, brush plate attaching (3)
15 Washer, lock (3)
16 Washer, flat (3)
17 Nut, terminal stud, special
18 Washer, lock 1/2 in.
19 Nut, terminal stud, lock, special
20 Washer, lock, 1/2 in.
21 Washer, plain, 1/2 in.
22 Insulator, terminal stud
23 Bushing, insulator, terminal stud
24 O-ring, terminal stud
25 Plate and stud assembly
26 Bushing, insulating (8)
27 Insulator, brush plate
28 Plate, support
29 Washer, insulating (2)

A. Brush Plate Assembly

1 Plug, lever housing
2 Gasket, lever housing, plug
3 Nut, plunger rod adjusting
4 Screw, switch attaching (4)
5 Washer, lock, switch attaching screw (4)
6 Switch
7 Snapring
8 Retainer
9 Spring
10 Retainer
11 Boot
12 Washer
13 Plunger
14 Screw, 5/16-18 x 1 1/2 in. (6)
15 Drive housing
16 Snapring
17 O-ring
18 Shaft
19 O-ring
20 Shift lever
21 Connector, lever attaching
22 Drive gear assembly
23 Gasket
24 Washer, brake
25 Screw, lever housing attaching
26 Washer, lock
27 Lever housing
28 O-ring

B. Starter Drive Assembly

1 Armature
2 Washer, spacer
3 Washer, spacer
4 Nut, field terminal stud
5 Washer, lock
6 Connector, terminal to switch
7 Frame and field coil assembly

C. Frame and Armature Assembly

Figure 6-2—Continued.

e. Cleaning.

(1) Clean all parts with an approved cleaning solution.

(2) Clean a slightly dirty or discolored commutator with No. 00 sandpaper. Blow out with compressed air after sanding. Remove all dirt from between commutator bars.

(3) Remove all dust, dirt, and foreign matter from frame fields by using clean, dry compressed air.

f. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

(2) Test the coils for continuity with a suitable meter. Replace open windings.

(3) Test armature on a growler tester. Replace a defective armature.

g. Reassembly. Reassemble the starter in reverse numerical sequence as illustrated on figure 6-2.

h. Installation. Refer to paragraph 3-65 and install the starter.

6-3. Alternator

a. General. The alternator is an alternating current type of generator which delivers 60 amperes at 1800 watts. It is located on the right side of the engine and belt driven from the crankshaft pulley.

b. Removal. Remove the alternator (para 3-63).

c. Bench Testing. Connect the alternator as shown in figure 1-7. With the alternator running at a speed of 2,000 r.p.m., adjust the voltage by removing the pipe plug from the drive end housing and turning the adjusting screw with a small screwdriver. The screw should be turned clockwise to reduce voltage and counterclockwise to increase voltage. Voltage should be adjusted to 27.5 to 28.0. After the voltage has been adjusted, apply a sixty ampere load. Alternator output should be 55 to 60 amps.

e. Cleaning. Clean all parts with an approved cleaning solution.

f. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

g. Reassembly. Reassemble the alternator in reverse of the numerical sequence as illustrated on figure 6-3.

h. Installation. Install the alternator (para 3-63).

6-4. Fuel Pump

a. General. The fuel pump is mounted on the right hand side of the engine and supplies fuel from the fuel tank to the injectors. It is a gear type pump driven from the rear of the blower assembly.

b. Testing. Install a suitable pressure gage in the fuel pump outlet line and check fuel pump pressure. Correct pressure is 40 to 60 p.s.i. at 1800 r.p.m. engine speed. If pressure is below 40 p.s.i., check the pressure relief valve for sticking, binding, or wear. Check fuel inlet line for restrictions.

c. Removal. Remove the fuel pump as instructed on figure 6-4.

d. Disassembly. Disassemble the fuel pump in the numerical sequence as illustrated on figure 6-5.

e. Cleaning. Clean all parts with an approved cleaning solution.

f. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

g. Reassembly. Reassemble the fuel pump in reverse of the numerical sequence as illustrated on figure 6-5.

h. Installation. Refer to paragraph 6-4 and install the fuel pump.

6-5. Fuel Injectors

a. General. The fuel injectors are mounted on the cylinder head and actuated by the rocker arms. The injectors inject a metered amount of fuel into the cylinders each time they are depressed by the rocker arms. The amount of fuel injected is controlled by the position of the control tube which is attached to the governor assembly.

b. Removal. Refer to figure 6-6 and remove the fuel injectors.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Testing.

(1) *Injector control rack and plunger movement test.* Check to see if the plunger works freely in its bushing and whether the control rack moves back and forth freely.

Caution: **Hold the injector in such a way as to prevent any fuel from penetrating the skin. Fuel oil, if it enters the blood stream, can cause poisoning.**

(2) *Valve opening pressure test.* Place the injector in fixture J7509-01. With the injector rack in full-fuel position, pump the handle of the test fixture with smooth even strokes and record the injector valve opening pressure. Correct opening pressure is 450 to 850 p.s.i.

(3) *Valve holding pressure test.* Operate the pump handle and bring the pressure up to a point just below opening pressure. Close the fuel shutoff valve and note the pressure drop. The time for a pressure drop from 450 p.s.i. to 250 p.s.i. must not be less than 40 seconds.

(4) *High pressure test.* With the injector rack in full-fuel position and the test fixture handle locked in position, operate the pump handle to build up and maintain pressure of 1600 to 2000 p.s.i.. Check the injector assembly for leaks at the filter cap gaskets, body plugs, seal ring area, and the injector rack hole.

(5) *Fuel output test.* Place the injector in comparator J7041 and tighten the hand wheel to seal it firmly. Pull out the injector rack to the no-fuel position. Set the comparator for 100 strokes. Start the comparator and after 30 seconds, press the fuel flow start button. The quantity of fuel in the vial should be between 18 and 24.

e. Disassembly. Disassemble the fuel injector assembly in the numerical sequence as illustrated on figure 6-7.

f. Inspection and Repair.

(1) Inspect the teeth on the control rack and the control rack gear for excessive wear or damage. Also, check for wear in the bore of the gear and inspect the gear retainer. Replace damaged or worn parts.

(2) Inspect the injector follower and pin for wear.

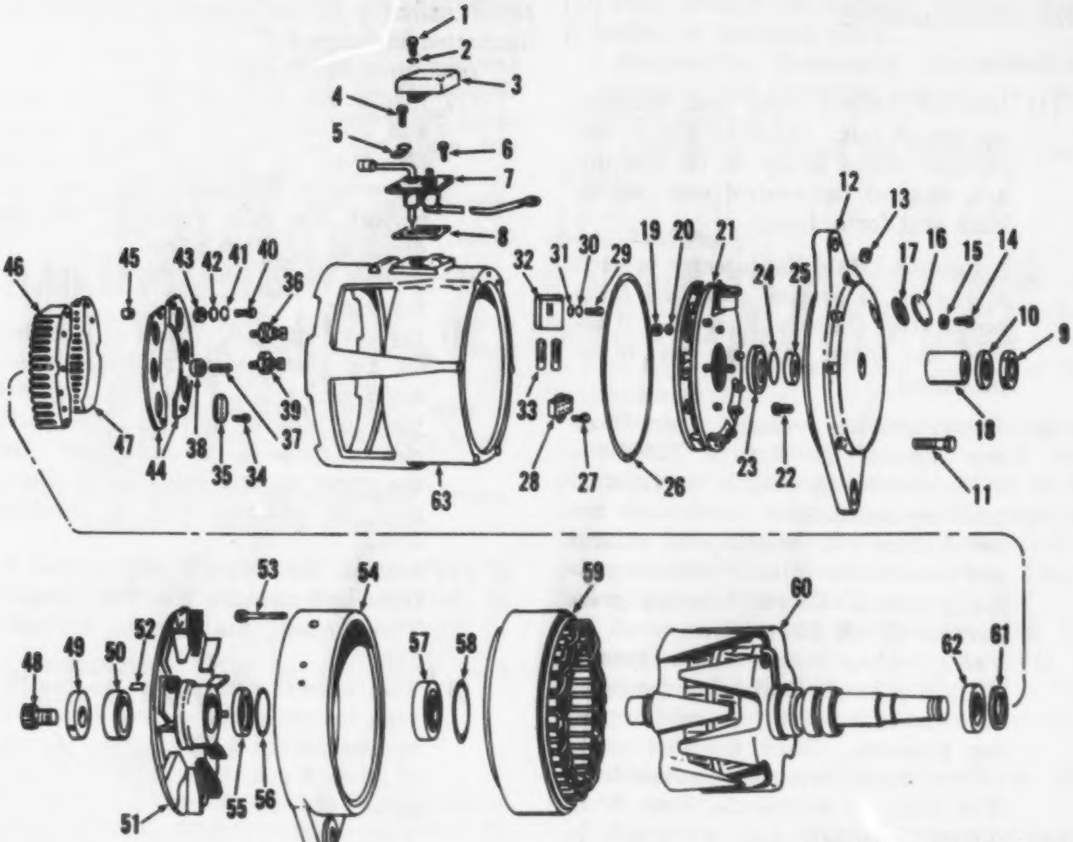
(3) Inspect both ends of the spill deflector for sharp edges or burrs which could create burrs on the injector body or injector nut and cause particles of metal to be introduced into the spray tip and valve parts. Burrs may be removed with a medium stone.

(4) Inspect the follower spring for defects and measure the free length. Then, check the spring in tester J5237.

(5) The follower spring used on the "S" type injectors has a free length of approximately 1.659 inches. A load of 56 ± 3 pounds is required to compress the spring to a length of 1.028 inches. Replace the spring when a load of less than 48 pounds will compress it to the 1.028 inches length.

(6) The follower spring used on all of the other Series 71 injectors has a free length of approximately 2.039 inches. A load of 38 ± 3 pounds is required to compress the spring to a length of 1.027 inches. Replace the spring when a load of less than 30 pounds will compress it to the 1.027 inches length.

(7) Check the seal ring area on the injector body for burrs or scratches. Also, check the surface which contacts the injector bushing for scratches, scuff marks, or other damage. If necessary, lap this surface. A faulty sealing surface at this point will result in high fuel comsumption


1
2
3
4
5
6
7
8
46
45
43
42
41
40
36
32
31
30
29
19
20
21
12
13
17
16
15
14
24
25
10
9
39
37
33
18
47
44
38
35
34
63
28
27
26
23
22
11
53
54
59
60
52
49
50
48
57
58
62
61
51
55
56

MEC 3810-287-15/6-3

1 Screw, 8-32 x 1/4" Rd. Hd. (2)
2 Washer, lock, No. 8 (10)
3 Cover
4 Screw, 8-32 x 3/8" Flat Hd. (4)
5 Clamp
6 Screw, 8-32 x 3/8" Fillet Hd. (4)
7 Capacitor and lead assembly
8 Gasket
9 Nut, 5/8"-16
10 Washer
11 Screw, 1/4-20 x 1 1/8", Socket Hd. (6)
12 Housing
13 Plug, pipe, 1/4-18
14 Screw, 6-32, flat hd. (2)
15 Washer, lock, No. 6 (2)
16 Plate, cover
17 Gasket
18 Spacer
19 Nut, 10-32, Hex
20 Washer, insulating
21 Regulator assembly
22 Screw, 10-32 x 5/8" Socket Hd. (4)
23 Bearing
24 O-ring
25 Spacer
26 O-ring
27 Screw, 6-32 x 3/8" Rd. Hd. (2)
28 Connector, socket
29 Screw, 8-32 x 7/16" Rd. Hd.
30 Washer, lock, No. 8 (10)
31 Washer
32 Holder, brush
33 Brush (2)
34 Screw, 8-32 x 3/8" Rd. Hd.
35 Insulator, support
36 Rectifier, Silicon (3)
37 Stud, 10-32 x 5/8"
38 Nut, 10-32, Hex

Figure 6-3. Alternator assembly, exploded view.

39	Rectifier, Silicon (3)
40	Screw. 10-32 x 5/8" Rd. Hd. (4)
41	Washer, lock, No. 10 (2)
42	Washer (4)
43	Washer, insulation (5)
44	Insulator, mount (2)
45	Bushing (3)
46	Mount, rectifier, positive
47	Mount, rectifier, negative
48	Screw, 1/4-20 x 3/4" Flat Hd.
49	Washer
50	Sleeve, seal
51	Fan and hub assembly
52	Key
53	Screw, 10-32 x 4 3/4" Socket Hd. (6)
54	Housing
55	Seal, teflon lip
56	O-ring
57	Bearing
58	O-ring
59	Stator assembly
60	Rotor assembly
61	Seal
62	Seal, teflon lip

Figure 6-3—Continued.

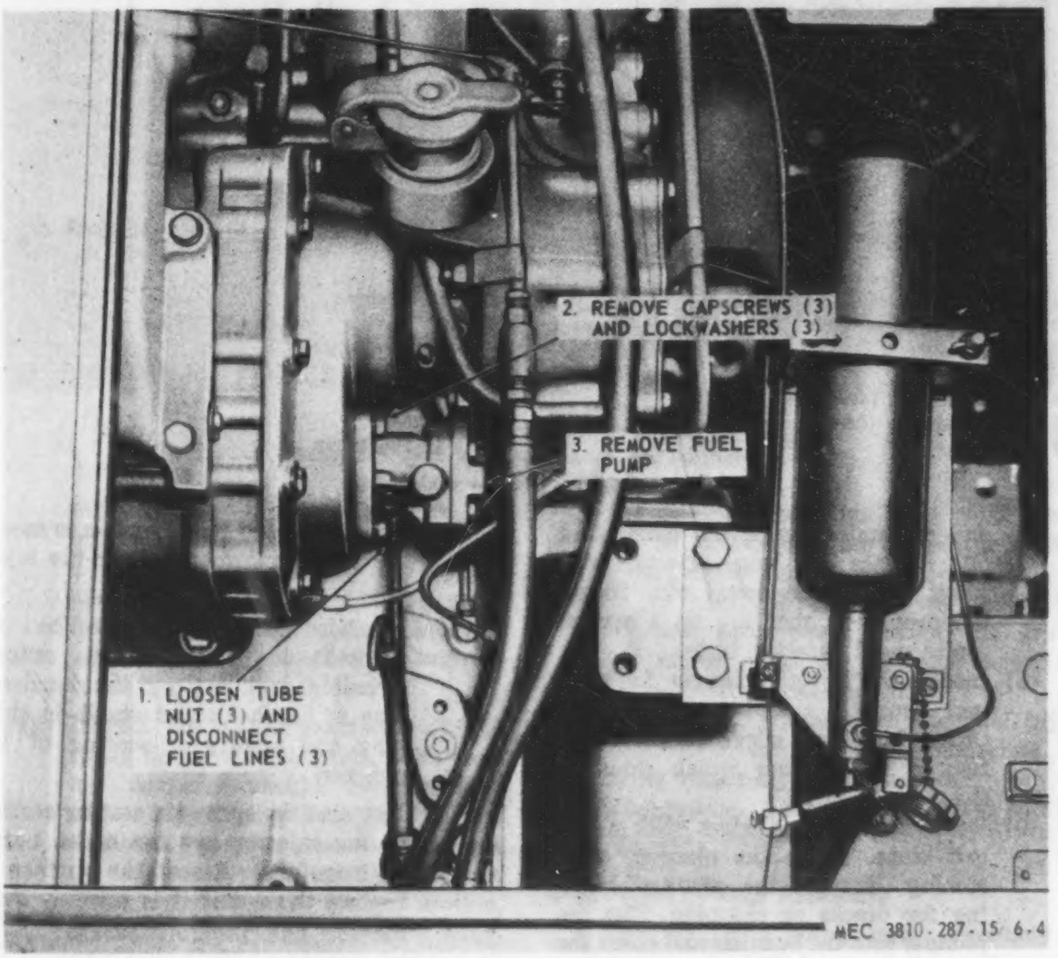
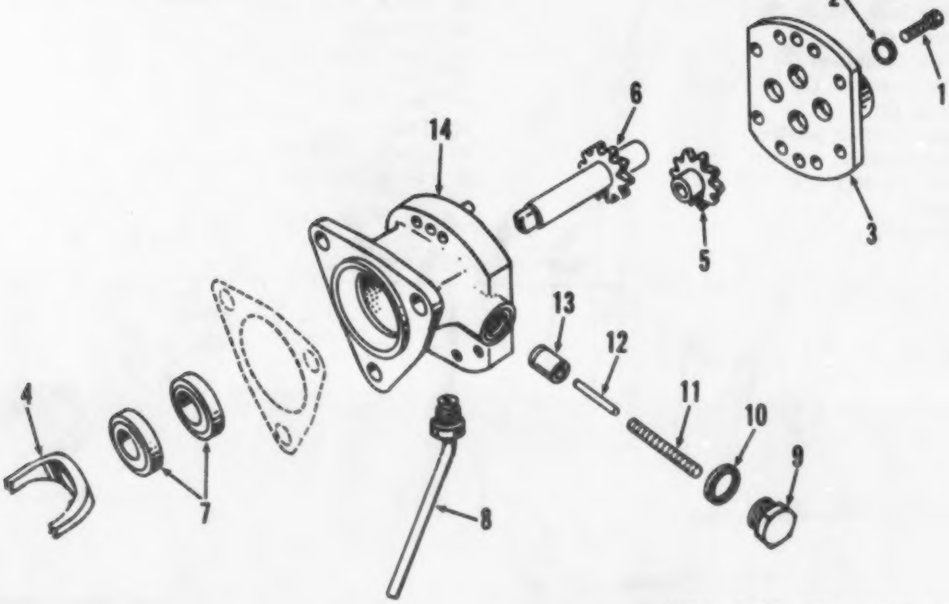

2. REMOVE CAPSCREWS (3)
AND LOCKWASHERS (3)
3. REMOVE FUEL
PUMP
1. LOOSEN TUBE
NUT (3) AND
DISCONNECT
FUEL LINES (3)
MEC 3810-287-15 6-4

Figure 6-4. Fuel pump, removal and installation.



1 Screw, socket head
2 Washer, seal
3 Cover
4 Fork, coupling
5 Shaft and gear (driven)
6 Shaft and gear (drive)
7 Seal (2)
8 Tube assembly
9 Plug, valve
10 Gasket, valve plug
11 Spring, valve
12 Valve
13 Pin, valve
14 Body, fuel pump

Figure 6–5. Fuel pump, exploded view.

and contamination of the lubricating oil. Replace any loose injector body plugs or a loose dowel pin. Install the proper number tag on a service replacement injector body.

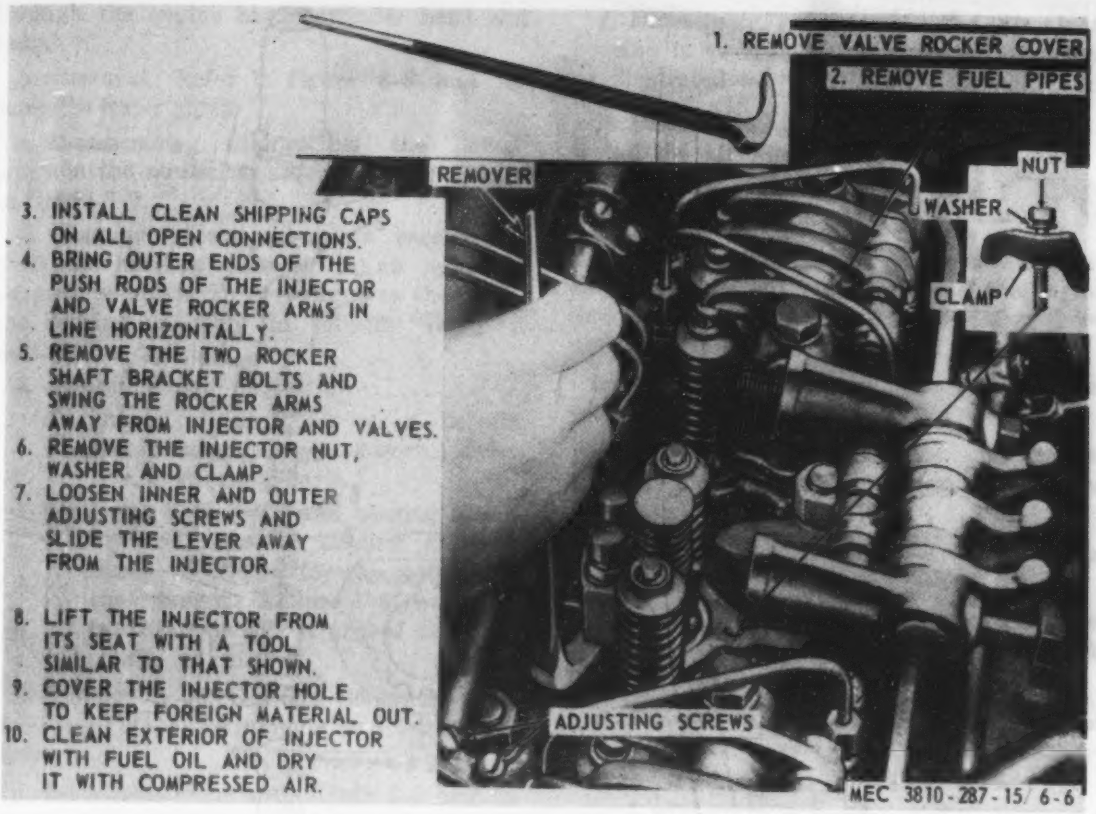
(8) Inspect the injector plunger for scoring, erosion, chipping, or wear. Check for sharp edges on that portion of the plunger which rides in the gear.

(9) Remove any sharp edges with a 500 grit stone. Wash the plunger after stoning. Inspect the plunger bushing for cracks or chipping. Slip the plunger into the bushing and check for free movement. Replace worn, chipped or scored plungers and bushings as an assembly since they are mated parts. Use new mated factory parts to assure the best performance from the injector.

(10) Injector plungers cannot be reworked to change the output. Grinding will destroy the hardened case at the helix and result in chipping and seizure or scoring of the plunger.

(11) Examine the spray tip seating surface of the injector nut for nicks, burrs, or brinelling. Reseat the surface or replace the nut if it is severely damaged.

(12) The injector valve spring plays an important part in establishing the valve opening pressure of the injec-



1. REMOVE VALVE ROCKER COVER
2. REMOVE FUEL PIPES
3. INSTALL CLEAN SHIPPING CAPS ON ALL OPEN CONNECTIONS.
4. BRING OUTER ENDS OF THE PUSH RODS OF THE INJECTOR AND VALVE ROCKER ARMS IN LINE HORIZONTALLY.
5. REMOVE THE TWO ROCKER SHAFT BRACKET BOLTS AND SWING THE ROCKER ARMS AWAY FROM INJECTOR AND VALVES.
6. REMOVE THE INJECTOR NUT, WASHER AND CLAMP.
7. LOOSEN INNER AND OUTER ADJUSTING SCREWS AND SLIDE THE LEVER AWAY FROM THE INJECTOR.
8. LIFT THE INJECTOR FROM ITS SEAT WITH A TOOL SIMILAR TO THAT SHOWN.
9. COVER THE INJECTOR HOLE TO KEEP FOREIGN MATERIAL OUT.
10. CLEAN EXTERIOR OF INJECTOR WITH FUEL OIL AND DRY IT WITH COMPRESSED AIR.

Figure 6–6. Fuel injectors, removal and installation.

tor assembly. Replace a worn or broken spring. When compressed to a length of .240 inches, the spring has a loading of 5 1/4 ± 1/2 pounds. Replace the spring when a load of less than 4 1/4 pounds will compress it to the .240 inches length.

(13) Inspect the sealing surfaces of the spray tip and valve parts. The sealing surfaces should be examined with a magnifying glass for even the slightest imperfections will prevent the injector from operating properly. Check for burrs, nicks, erosion, cracks, chipping and excessive wear. Also, check for enlarged orifices in the spray tip. Replace damaged or excessively worn parts.

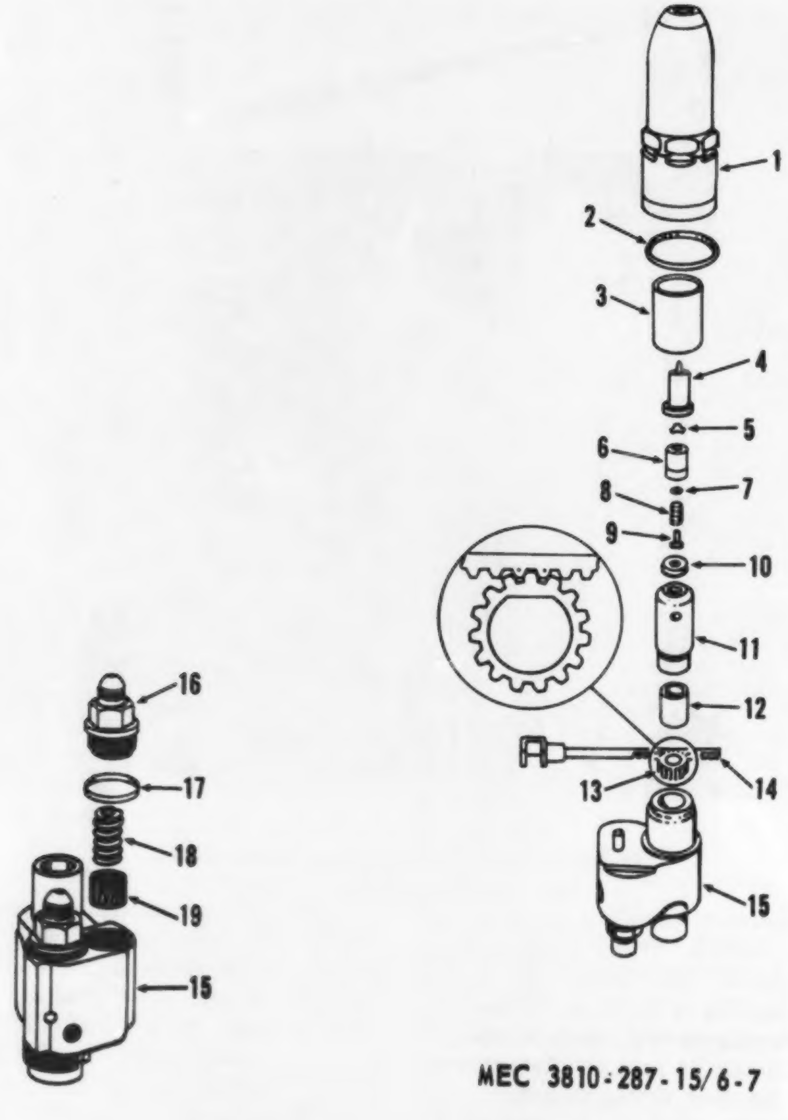
(14) Before reinstalling used valve parts in an injector, lap all of the sealing surfaces (except the crown valve). It is also good practice to lightly lap new valve parts (except the crown valve) which may become burred or nicked during handling.

g. Reassembly. Reassemble the fuel injector assembly in reverse of the numerical sequence as illustrated on figure 6–7.

h. Installation. Refer to figure 6–6 and install the fuel injectors.

6–6. Water Pump Assembly

a. General. The water pump assembly is mounted on the left front of the engine and driven from the lower blower rotor shaft. It is a centrifugal type and circulates the coolant


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
15
MEC 3810-287-15/6-7

1	Nut
2	Seal ring
3	Spill deflector
4	Spray tip
5	Check valve
6	Valve cage
7	Valve stop
8	Valve spring
9	Injector valve
10	Valve seat
11	Bushing
12	Gear retainer
13	Gear
14	Control rack
15	Injector body
16	Filter cap
17	Gasket
18	Spring
19	Filter

Figure 6–7. Fuel injector assembly, exploded view.

through the engine block, cylinder head and radiator.

b. Removal. Refer to figure 6-8 and remove the water pump.

c. Disassembly. Disassemble the water pump in the numerical sequence as illustrated on figure 6-9.

d. Cleaning. Clean all parts except the shaft and bearing assembly in an approved cleaning solution. Do not immerse the shaft and bearing assembly in solvent. Wipe it clean with a dry cloth.

e. Inspection and Repair.

(1) Inspect all parts for wear, defects, and damage. Replace worn, defective, or damaged parts.

(2) Inspect the shaft and bearing assembly for signs of binding and evidence of grit or foreign material in the bearing. Replace the shaft and bearing assembly if any of the above conditions exist.

f. Reassembly. Reassemble the water pump in reverse of the instructions as illustrated on figure 6-9.

g. Installation. Refer to figure 6-8 and install the water pump assembly.

6-7. Air Inlet Housing

a. General. The air inlet housing is located on the left hand side of the engine and mounted on the blower assembly. It is the mounting base for the air cleaner assembly and directs air from the air cleaner into the blower assembly. A valve assembly is incorporated into the housing to provide emergency shutdown device as protection for the engine.

b. Removal. Refer to figure 6-10 and remove the air inlet housing.

c. Disassembly. Disassemble the air inlet housing in the numerical sequence as illustrated on figure 6-11.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for wear, defects, and damage. Replace worn, defective, or damaged parts.

f. Reassembly. Reassemble the air inlet housing in reverse of the numerical sequence as illustrated on figure 6-11.

g. Installation. Refer to figure 6-10 and install the air inlet housing.

6-8. Blower Drive Assembly

a. General. The blower drive assembly is located on the left rear corner of the engine and transmits power from the accessory drive gears to the blower assembly.

b. Removal. Refer to figure 6-12 and remove the blower drive assembly.

c. Disassembly. Disassemble the blower drive assembly in the numerical sequence as illustrated on figure 6-13.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for wear, defects, and damage. Replace worn, defective, or damaged parts.

f. Reassembly. Reassemble the blower drive assembly in reverse of the numerical sequence as illustrated on figure 6-13.

g. Installation. Refer to figure 6-12 and install the blower drive assembly.

6-9. Blower Assembly

a. General. The blower assembly is located on the left side of the engine and mounted directly on the engine block. It forces fresh air into the cylinders for combustion and purges the exhaust gases from the cylinders as the exhaust valves open.

b. Removal. Refer to figure 6-14 and remove the blower assembly.

c. Disassembly. Disassemble the blower assembly in the numerical sequence as illustrated on figure 6-15.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for wear, defects, and damage. Replace worn, defective, or damaged parts.

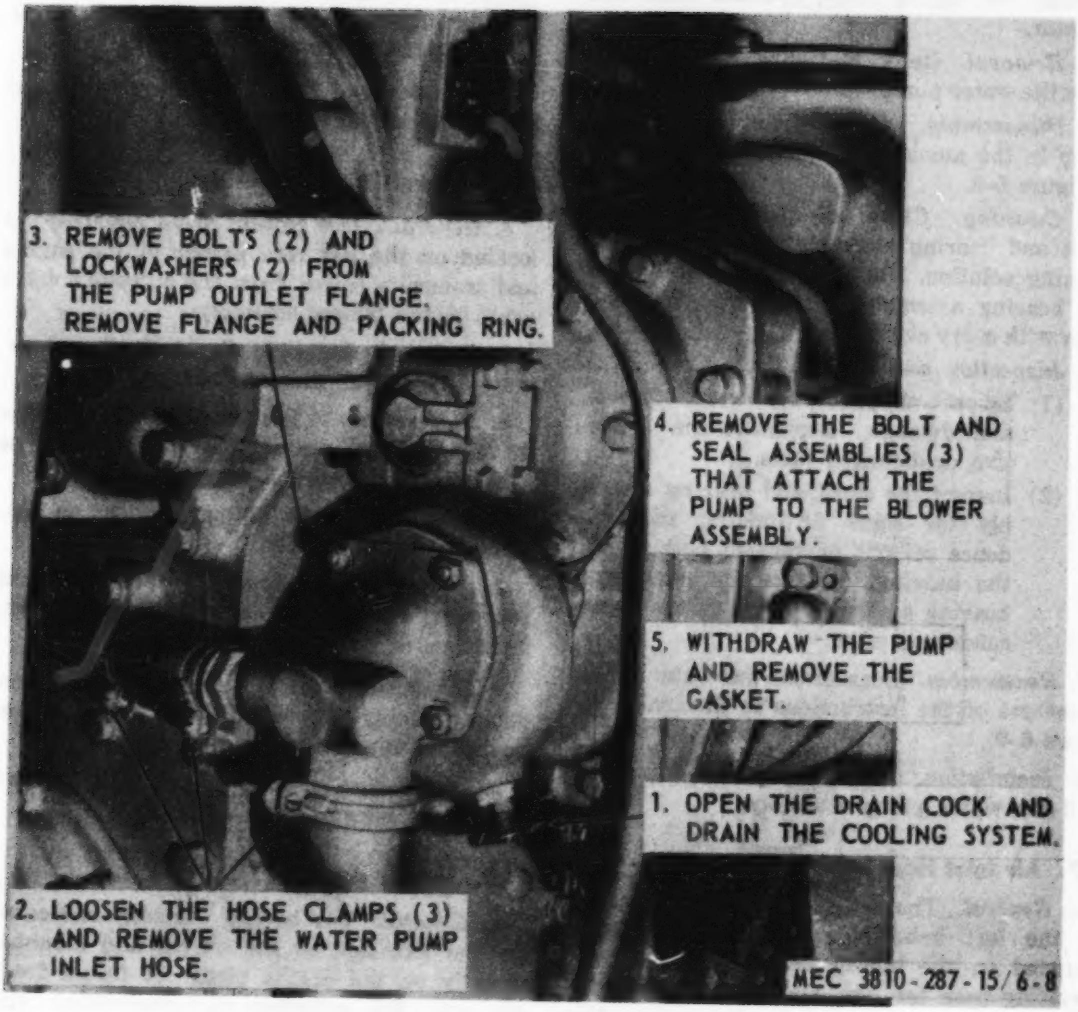

3. REMOVE BOLTS (2) AND LOCKWASHERS (2) FROM THE PUMP OUTLET FLANGE. REMOVE FLANGE AND PACKING RING.
4. REMOVE THE BOLT AND SEAL ASSEMBLIES (3) THAT ATTACH THE PUMP TO THE BLOWER ASSEMBLY.
5. WITHDRAW THE PUMP AND REMOVE THE GASKET.
1. OPEN THE DRAIN COCK AND DRAIN THE COOLING SYSTEM.
2. LOOSEN THE HOSE CLAMPS (3) AND REMOVE THE WATER PUMP INLET HOSE.
MEC 3810-287-15/6-8

Figure 6-8. Water pump assembly, removal and installation.

f. Reassembly. Reassemble the blower assembly in reverse of the numerical sequence as illustrated on figure 6-15.

g. Installation. Refer to figure 6-14 and install the blower assembly.

6-10. Fan Assembly

a. General. The fan assembly is mounted on the front of the engine and belt driven from the engine crankshaft. The fan forces air through the radiator to cool the liquid in the cooling system.

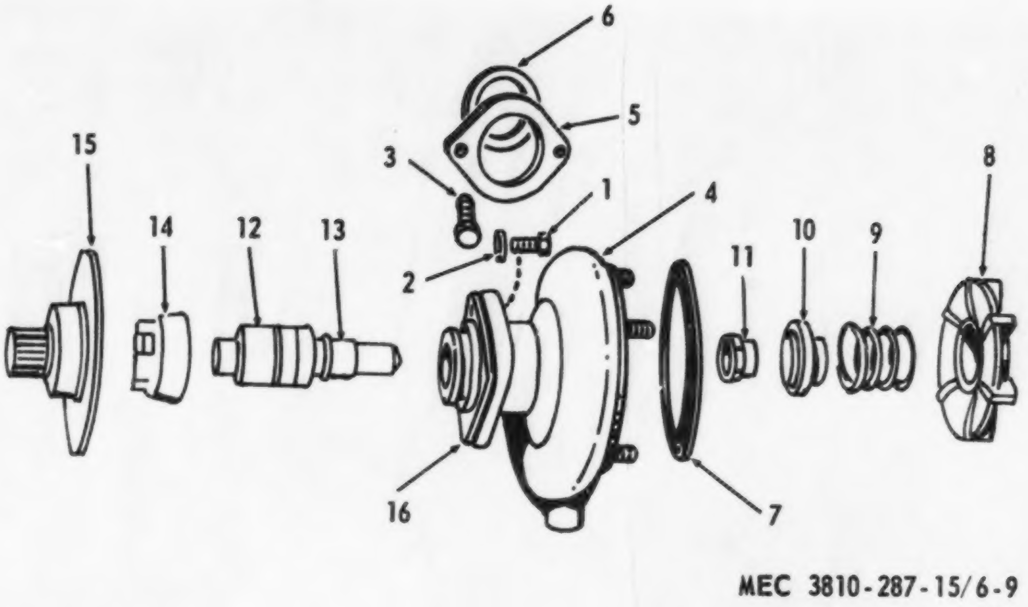
b. Removal. Refer to paragraph 3-58 and remove the fan assembly.

c. Disassembly. Disassemble the fan assembly in the numerical sequence as illustrated on figure 6-16.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for wear, defects, and damage.

f. Reassembly. Reassemble the fan assembly in reverse of the numerical sequence as illustrated on figure 6-16.



1	Screw, cap (3)
2	Washer, lock (3)
3	Screw, cap (2)
4	Body
5	Flange
6	Packing
7	Gasket
8	Impeller
9	Spring
10	Seal
11	Insert
12	Slinger
13	Shaft and bearing assembly
14	Thrower
15	Coupling, water pump to blower
16	Gasket

Figure 6-9. Water pump assembly, exploded view.

g. Installation. Refer to paragraph 3-58 and install the fan assembly.

6-11. Governor Assembly

a. General. The governor assembly is located on the left front of the engine and driven from the upper blower rotor shaft. The governor is connected through linkage to the injector control tube and maintains a constant engine speed in relation to the throttle setting.

b. Removal. Refer to paragraph 3-48 and remove the governor assembly.

c. Disassembly. Disassemble the governor assembly in the numerical sequence as illustrated on figure 6-17.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective, or damaged parts.

(2) Revolve operating shaft bearing and governor weight shaft bearing slowly by hand; replace bearings if rough or tight spots are detected.

(3) Inspect operating shaft and shaft bushing for excessive wear. If excessive wear is noted, a new bushing and shaft must be installed.

(4) Examine riser thrust bearing for excessive wear, flat spots or corrosion. If any of these conditions exist, a new thrust bearing assembly must be installed.

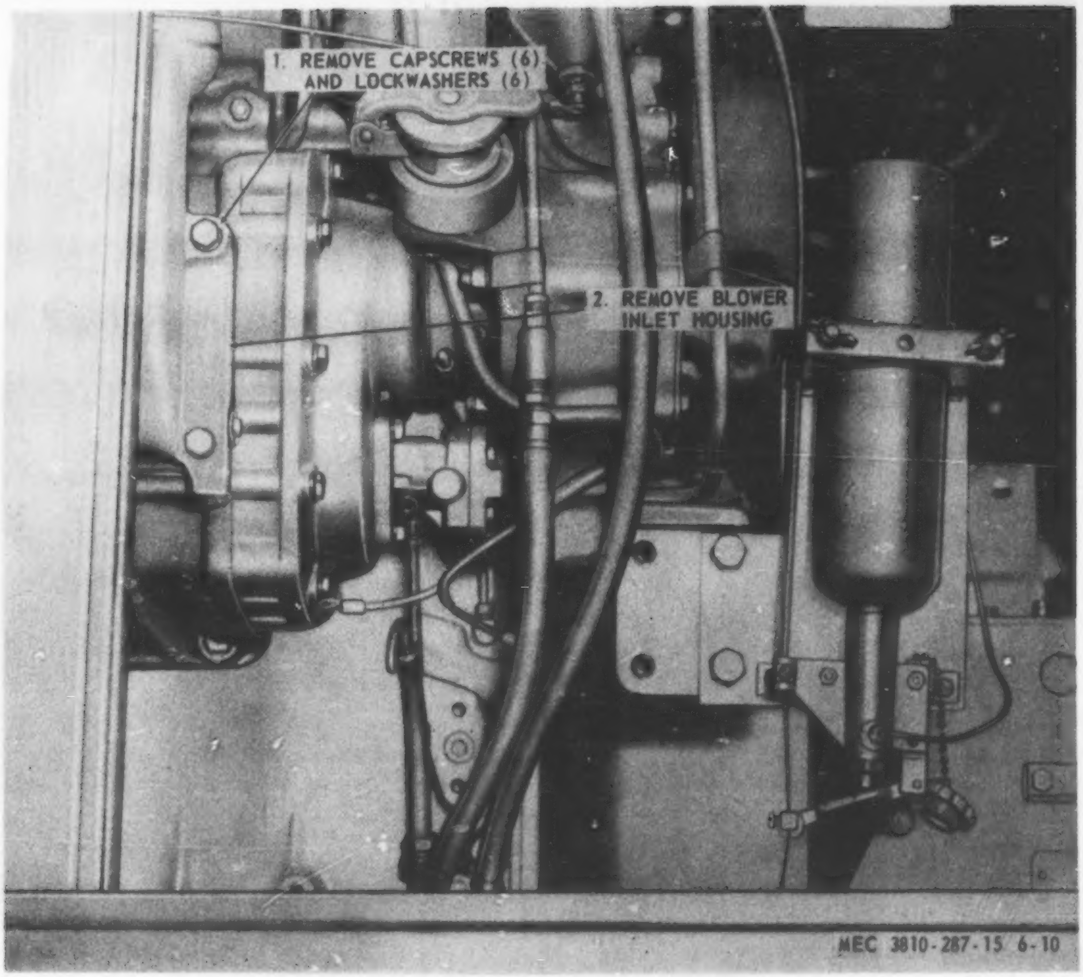

1. REMOVE CAPSCREWS (6) AND LOCKWASHERS (6)
2. REMOVE BLOWER INLET HOUSING
MEC 3810-287-15 6-10

Figure 6-10. Air inlet housing, removal and installation.

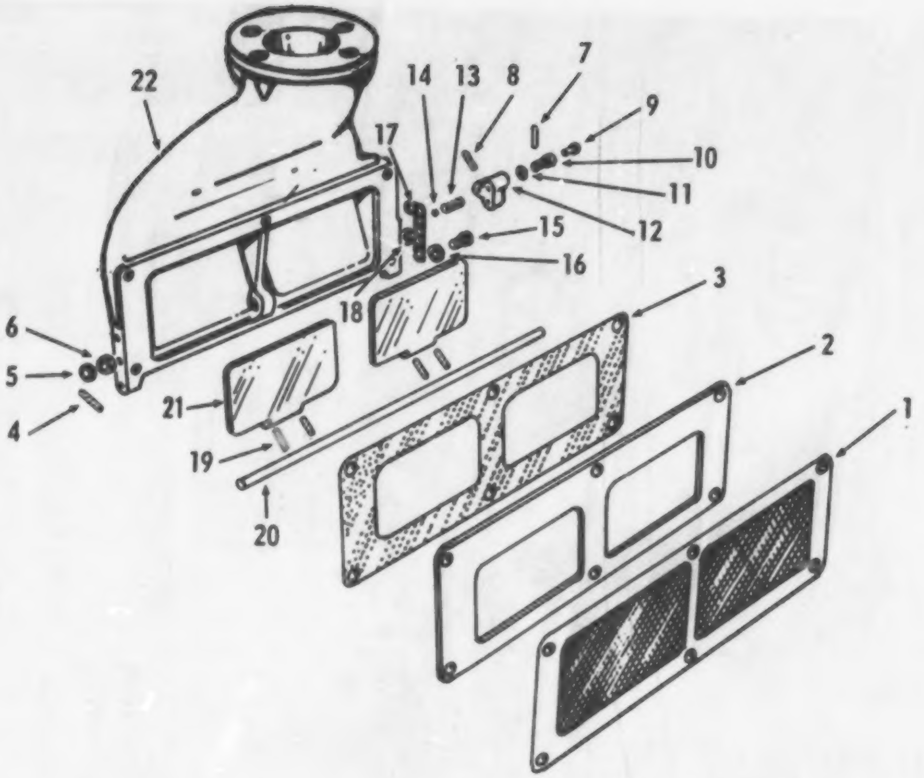
(5) Inspect roller bearings and control lever shaft for excessive wear or flat spots. If one or both conditions exist, new bearings and control shaft must be installed.

(6) If new bearings are installed in the governor cover, the lower bearing should be flush with the lower end of the bearing boss. The upper bearing must be pressed in approximately 1/8 inch below the top surface of the upper bearing boss.

(7) Inspect spring lever shaft and bearings for excessive wear or flat spots at bearing surface. If one or both conditions exist, a new shaft and bearings must be installed.

(8) Examine weight carrier pins and bearings for excessive wear and flat spots. If either of these conditions exist, new parts must be installed.

(9) Check the finished surface of governor weights for flat spots. If flat spots are noted, new weights should be installed.



MEC 3810-287-15/6-11

1	Blower screen
2	Striker plate
3	Gasket
4	Pin, cotter, 1 1/8 x 1 1/4 in.
5	Washer, flat, special
6	O-ring
7	Pin, roll
8	Pin, roll
9	Screw, cap 1/4-20 x 3/4 in. (2)
10	Screw
11	Washer, flat, special
12	Lever
13	Spring
14	Ball
15	Screw, cap
16	Washer, flat
17	Lockplate
18	O-ring
19	Pin (4)
20	Shutdown valve shaft
21	Shutdown valve (2)
22	Air inlet housing

Figure 6-11. Air inlet housing, exploded view.

f. Reassembly. Reassemble the governor assembly in reverse of the numerical sequence as illustrated on figure 6-17.

g. Installation. Refer to paragraph 3-48 and install the governor assembly.

h. Adjustment. Refer to paragraph 3-48 and adjust the governor.

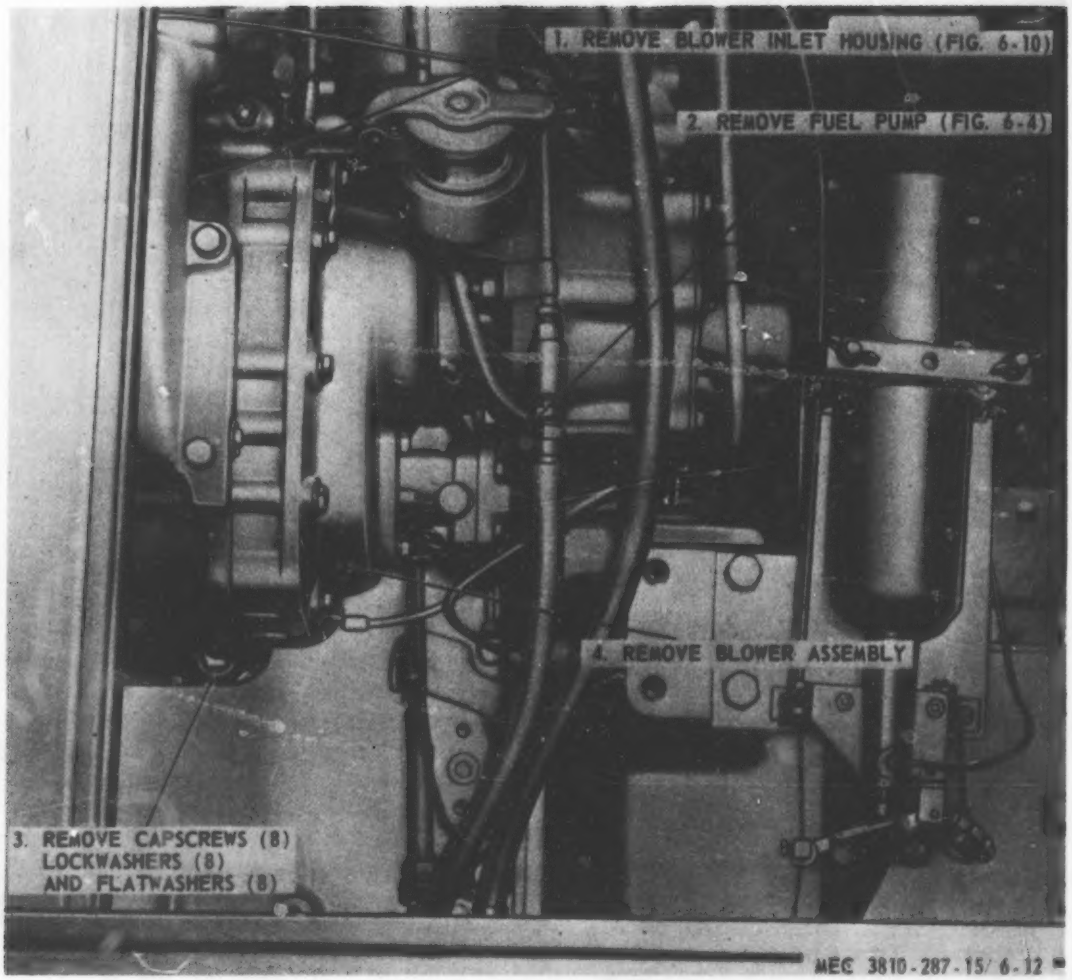
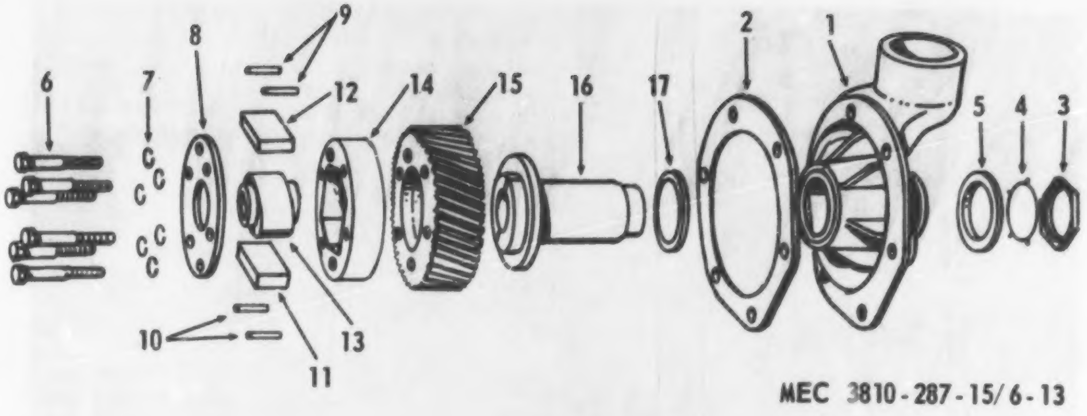
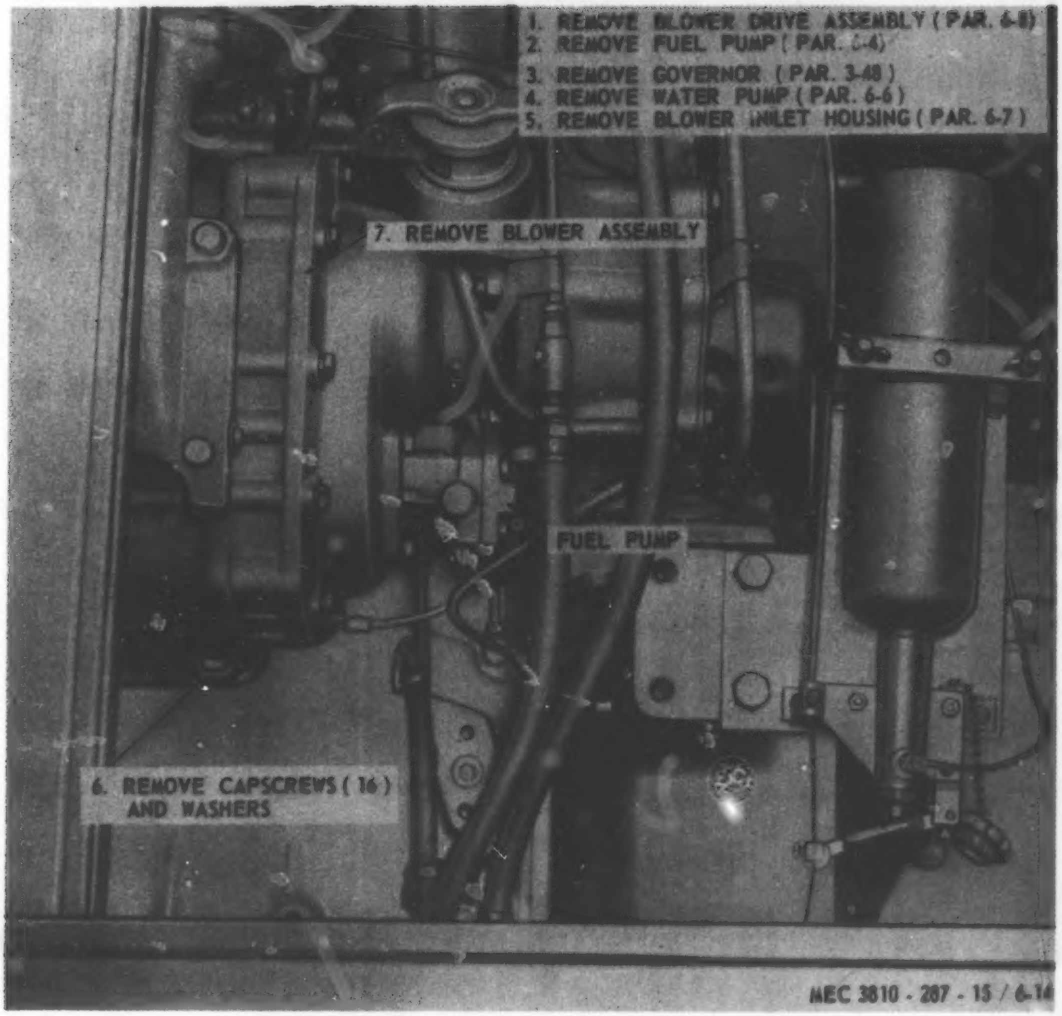

1. REMOVE BLOWER INLET HOUSING (FIG. 6-10)
2. REMOVE FUEL PUMP (FIG. 6-4)
3. REMOVE CAPSCREWS (8)
LOCKWASHERS (8)
AND FLATWASHERS (8)
4. REMOVE BLOWER ASSEMBLY
MEC 3810-287-15/6-12

Figure 6-12. Blower drive assembly, removal and installation.


9
8
6
7
12
14
15
16
17
2
1
5
4
3
10
13
11
MEC 3810-287-15/6-13

1 Hub support
2 Hub support gasket
3 Drive gear hub nut
4 Lock, special
5 Thrust washer
6 Bolt, 5/16-24 x 2 1/2 in. (6)
7 Washer, lock, 5/16 in. (6)
8 Blower drive coupling retainer
9 Spring seat (2)
10 Spring seat (2)
11 Blower drive coupling spring
12 Blower drive coupling spring
13 Blower drive coupling cam
14 Coupling support
15 Blower drive gear
16 Blower drive gear hub
17 Seal

Figure 6-18. Blower drive assembly, exploded view.



1. REMOVE BLOWER DRIVE ASSEMBLY (PAR. 6-8)
2. REMOVE FUEL PUMP (PAR. 6-4)
3. REMOVE GOVERNOR (PAR. 3-48)
4. REMOVE WATER PUMP (PAR. 6-6)
5. REMOVE BLOWER INLET HOUSING (PAR. 6-7)
6. REMOVE CAPSCREWS (16) AND WASHERS
7. REMOVE BLOWER ASSEMBLY

Figure 6–14. Blower assembly, removal and installation

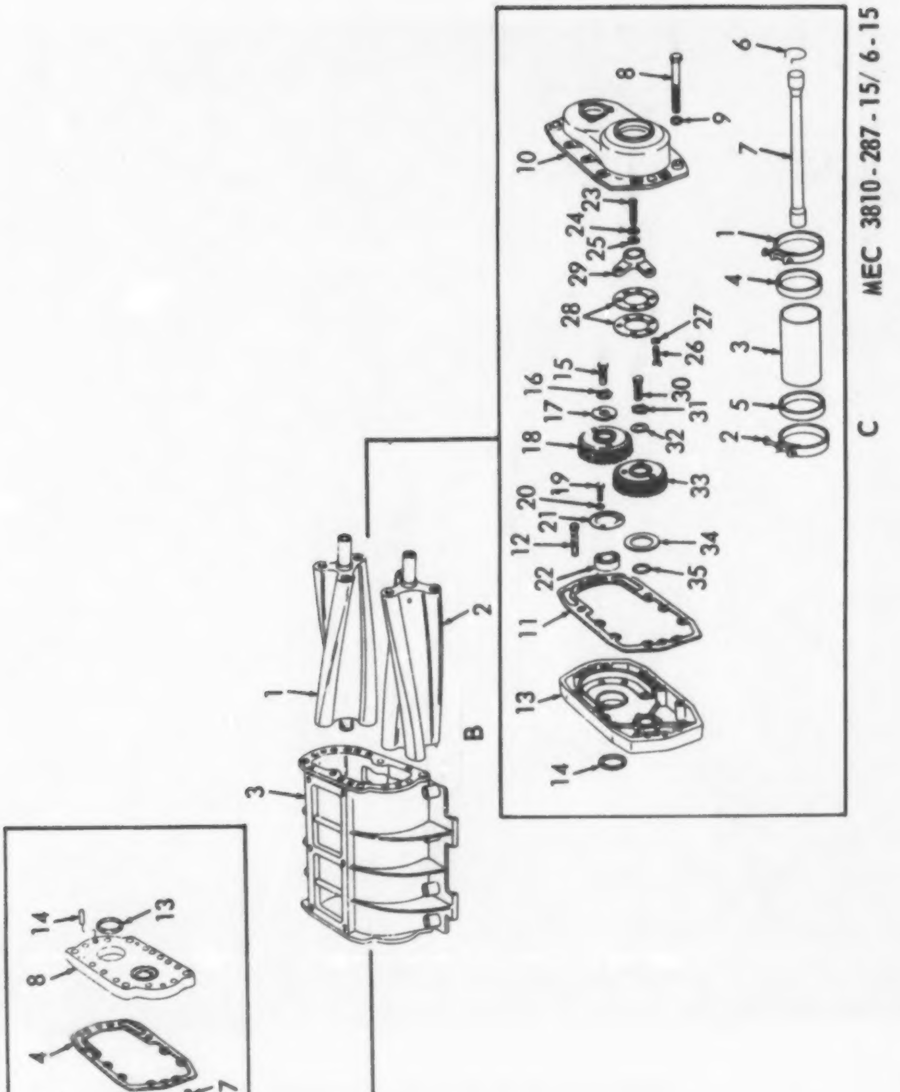

A
1
2
3
5
6
9
10
11
12
4
7
8
14
13
B
3
1
2
C
14
13
11
22
12
21
20
19
34
35
33
18
17
16
15
32
31
30
28
29
26
27
25
24
23
10
8
9
6
7
1
4
3
5
2
MEC 3810-287-15/6-15

Figure 6-15. Blower assembly, exploded view.

1 Bolt, 5/16-18 x 3 1/2 in. (12)
2 Washer, lock, 5/16 in. (12)
3 Front plate cover
4 Gasket
5 Bolt, 5/16-24 x 1 1/2 in.
6 Water pump drive coupling assembly
7 Bolt, 5/16-18 x 1 1/2 in. (4)
8 Front end plate cover
9 Screw, cap, 1/4-20 x 3/4 in. (3)
10 Washer, lock 1/4 in. (3)
11 Bearing retainer (2)
12 Bearing (2)
13 Seal (2)
14 Dowel

A. Blower End Housing Assembly

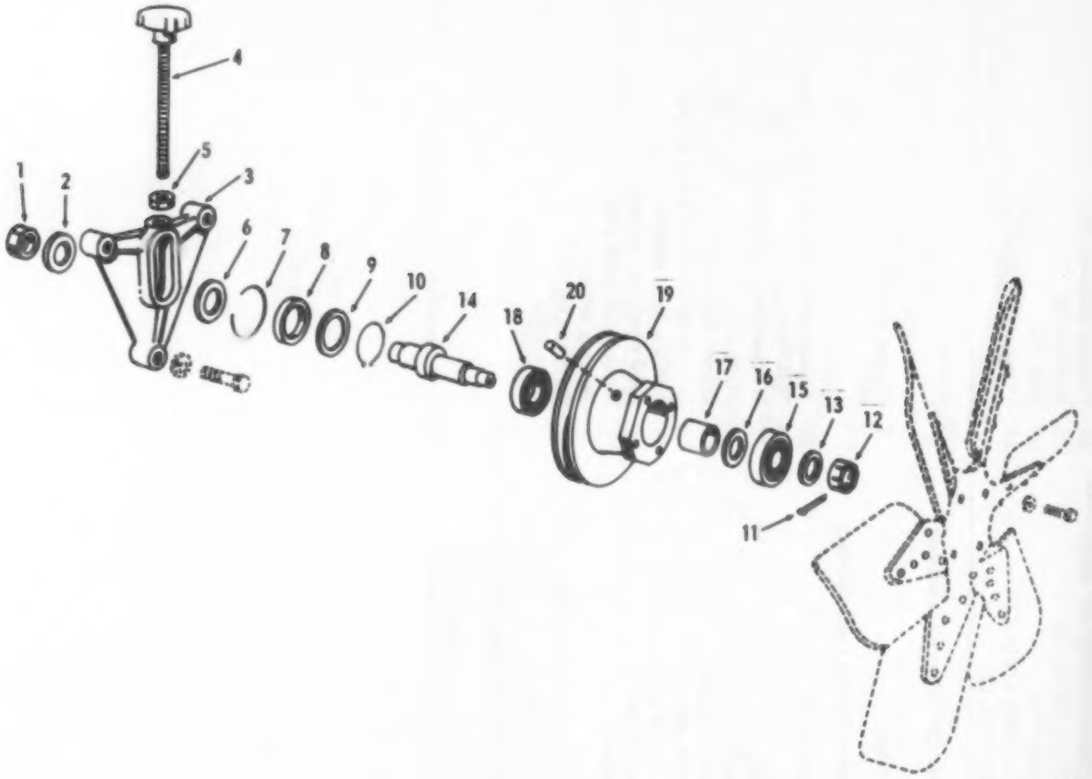
1 Left-hand rotor
2 Right-hand rotor
3 Blower housing

B. Blower Housing and Rotors

1 Packing clamp
2 Packing clamp
3 Blower drive cover
4 Packing
5 Packing
6 Snap ring
7 Blower drive shaft
8 Bolt, 5/16-18 x 3 1/2 in. (8)
9 Washer, lock, 5/16 in. (8)
10 Rear plate cover
11 Gasket
12 Bolt, 5/16-18 x 1 1/2 in. (4)
13 Rear end plate cover
14 Seal (2)
15 Bolt, special
16 Washer, lock, special
17 Fuel pump coupling disc
18 Left-hand rotor gear
19 Screw, cap, 1/4-20 x 3/4 in. (3)
20 Washer, lock 1/4 in. (3)
21 Bearing retainer
22 Bearing (2)
23 Screw, cap, 5/16-18 x 3/4 in. (5)
24 Washer, flat, special (2)
25 Washer, lock, 5/16 in. (2)
26 Bolt, special
27 Washer, lock, 5/16 in.
28 Plate (2)
29 Blower rotor hub
30 Screw, cap, 5/16-18 x 3/4 in. (4)
31 Washer, lock, special
32 Gear retaining washer
33 Right-hand rotor gear
34 Bearing retainer
35 Shim (as rqr)

C. Blower End Housing Assembly

Figure 6-15.—Continued.



MEC 3810-287-15/6-16

1 Nut, hex
2 Washer, flat, 7/8 in.
3 Support
4 Bolt, adjusting (special)
5 Nut, hex, 1/2-20
6 Washer, flat, 7/8 in.
7 Retainer, seal
8 Seal
9 Seal
10 Seal
11 Pin, cotter, 3/32 x 1 in.
12 Nut, castellated, 7/8-14
13 Retainer, bearing
14 Shaft, fan
15 Bearing
16 Retainer, bearing
17 Spacer, bearing
18 Bearing
19 Pulley, fan
20 Fitting, lube, 1/8 in. x 45°

Figure 6-16. Fan assembly, exploded view.

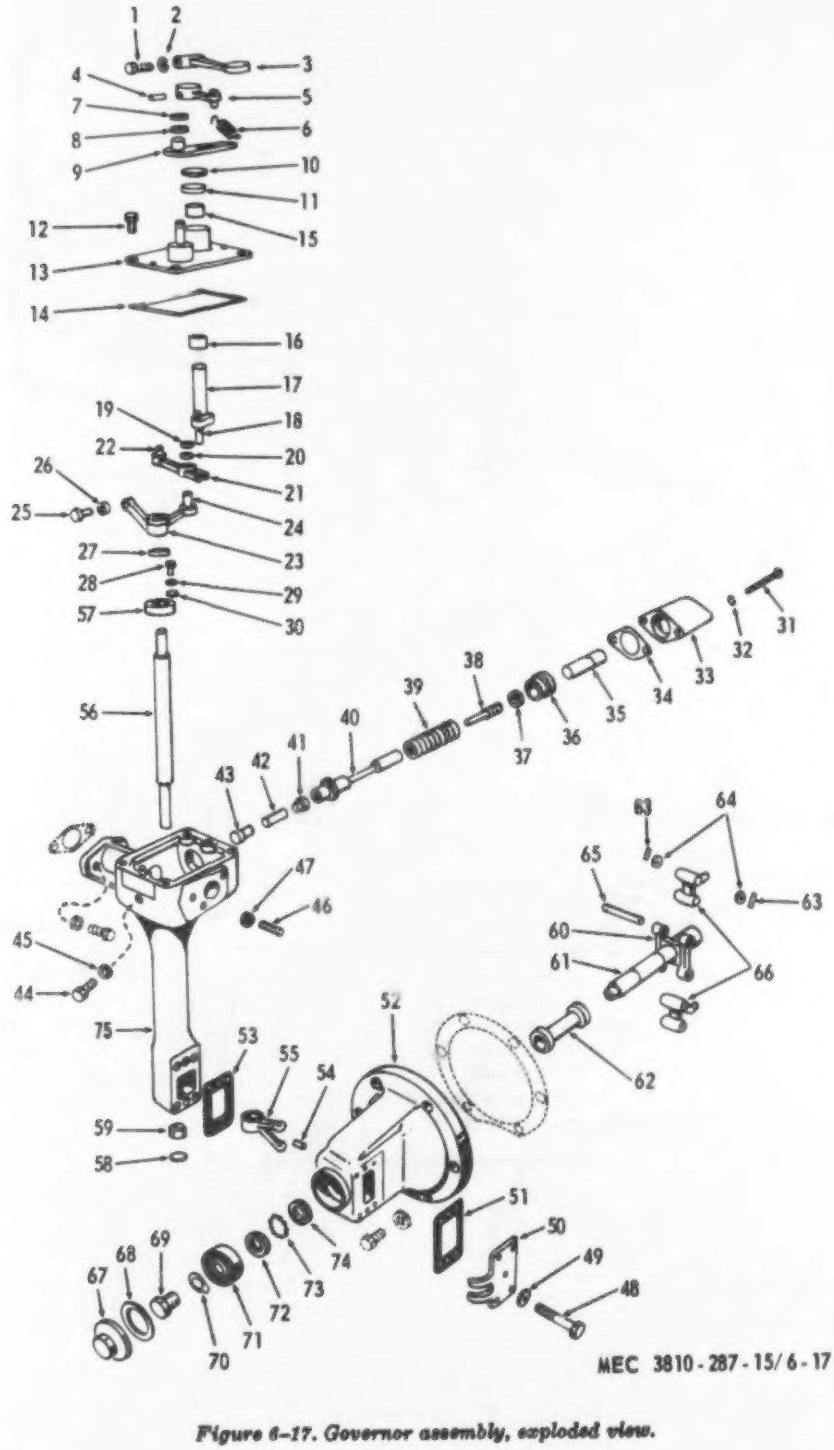

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
63
64
65
66
67
68
69
70
71
72
73
74
75
MEC 3810-287-15/6-17

Figure 6-17. Governor assembly, exploded view.

1 Screw, cap, 1/4-20 x 1 in. (4)
2 Washer, lock, 1/4 in. (4)
3 Throttle shaft lever
4 Pin
5 Lever
6 Spring
7 Snapring
8 Retainer
9 Cam
10 Retainer
11 Seal
12 Screw, machine, No. 10-32 x 3/8 in.
13 Cover
14 Gasket
15 Bearing
16 Bearing
17 Shaft and lever assembly
18 Pin
19 Retainer
20 Washer
21 Lever assembly
22 Pin
23 Lever
24 Pin
25 Screw, gap adjusting, 1/4-28 x 1/2 in.
26 Nut, hex, 1/4-28
27 Washer
28 Screw, No. 10-24 x 7/16 in.
29 Washer, lock, int. tooth No. 10
30 Washer, flat, No. 10
31 Bolt, 5/16-18 x 3 in. (2)
32 Washer, lock, 5/16 in. (2)
33 Housing
34 Gasket
35 Spring retainer
36 Locknut
37 Nut, 1/4-28
38 Screw, special
39 Spring
40 Plunger
41 Seat
42 Spring
43 Cap
44 Screw
45 Washer, lock, 1/4 in.
46 Screw, buffer adjusting
47 Nut, special
48 Bolt, 1/4-20 x 2 3/8 in. lg. (4)
49 Washer, lock, 1/4 in. (4)
50 Cover
51 Gasket
52 Housing
53 Gasket
54 Pin
55 Fork
56 Shaft
57 Bearing
58 Plug
59 Bushing
60 Carrier and weight assembly
61 Shaft
62 Riser
63 Pin
64 Washer
65 Pin
66 Weight
67 Cap
68 Gasket
69 Screw, bearing retainer
70 Lock, bearing retainer screw
71 Bearing
72 Outer race
73 Bearing
74 Inner race
75 Housing

Figure 6-17.—Continued.

Section II. ENGINE COMPONENTS

6-12. General

The engine is a three-cylinder, two-cycle diesel with overhead valves. The engine components are fully described in applicable paragraphs in this section.

6-13. Rocker Arm Shaft Assembly

a. General. The rocker arm shaft assembly is mounted on top of the cylinder head. The rocker arms are actuated by the cam shaft through push rods and actuate the exhaust valves and injectors.

b. Removal.

(1) Refer to paragraph 3-45 and remove the rocker arm cover.

(2) Refer to figure 6-18 and remove the rocker arm shaft assembly.

c. Disassembly. Disassemble the rocker arm shaft assembly in the numerical sequence as illustrated on figure 6-19.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

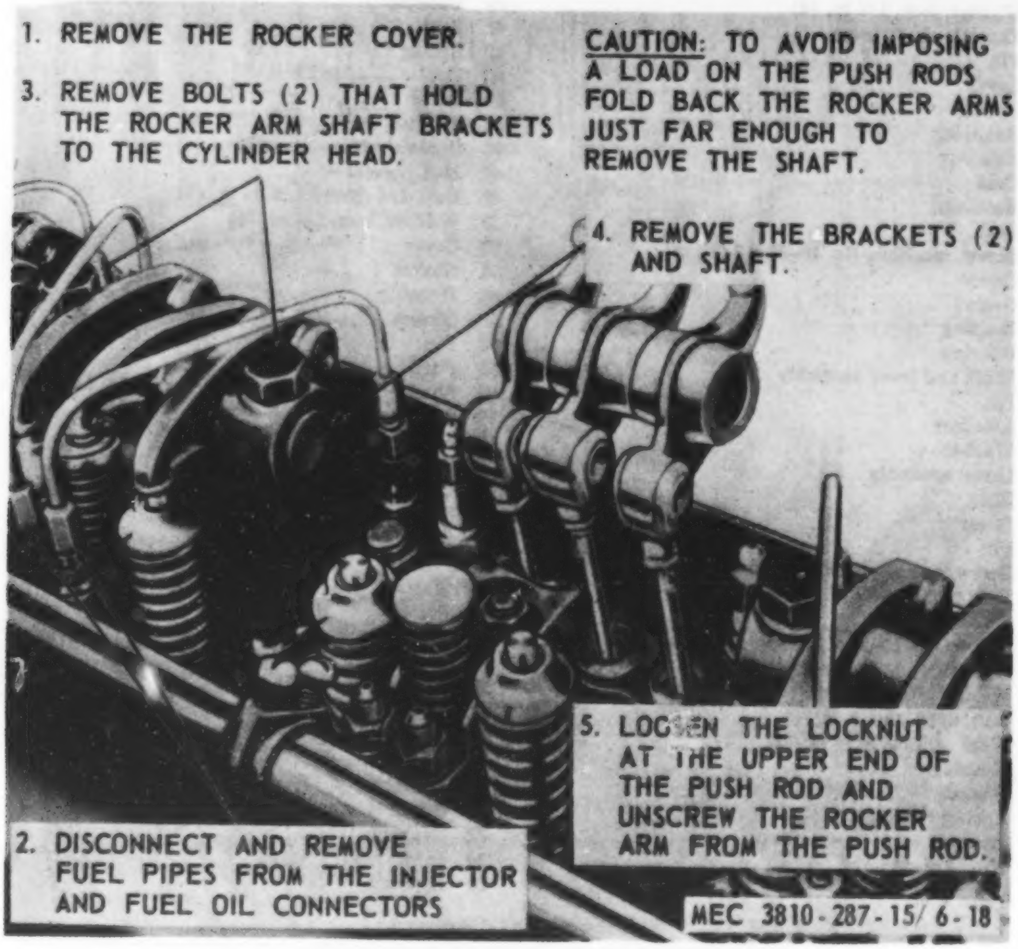

1. REMOVE THE ROCKER COVER.
3. REMOVE BOLTS (2) THAT HOLD THE ROCKER ARM SHAFT BRACKETS TO THE CYLINDER HEAD.
CAUTION: TO AVOID IMPOSING A LOAD ON THE PUSH RODS FOLD BACK THE ROCKER ARMS JUST FAR ENOUGH TO REMOVE THE SHAFT.
4. REMOVE THE BRACKETS (2) AND SHAFT.
5. LOOSEN THE LOCKNUT AT THE UPPER END OF THE PUSH ROD AND UNSCREW THE ROCKER ARM FROM THE PUSH ROD.
2. DISCONNECT AND REMOVE FUEL PIPES FROM THE INJECTOR AND FUEL OIL CONNECTORS
MEC 3810-287-15/ 6-18

Figure 6-18. Rocker arm shaft assembly, removal and installation.

(2) It is very important to inspect the rocker arm shaft bolts for plugged oil passages. The 1/16 inch hole, perpendicular to the bolt axis, is drilled only halfway through on bolts used in early engines. Rework these bolts by drilling the hole completely through the bolt to improve lubrication. After drilling be sure the bolt is free of metal particles and burrs.

(3) Inspect the rocker arm shaft and the bushings inside of the rocker arms for excessive wear. The diameter of a new rocker arm shaft is .8735 inch to .8740 inch. Thus, with new parts, the clearance is .001 inch to .0025 inch. A maximum clearance of .004 inch is allowable with worn parts. Service replacement bushings must be reamed to size after installation.

(4) Inspect the rocker arms for wear or galling on the pallets (valve contact surfaces). If worn, the pallets may be refaced up to a maximum depth of .010 inch. However, proceed with

caution when surface grinding so that the rocker arms are not overheated. Maintain the radius and finish as close to the original surface as possible.

(5) On former engines that incorporate injector rocker arms with a ball and seat type contact face, inspect the ball and seat for wear or looseness. Replace the ball and seat, if necessary, or replace the entire assembly with a new pallet type rocker arm.

(6) Proper cam follower inspection and service are very necessary in obtaining continued efficient engine performance. When any appreciable change in the injector timing or exhaust valve clearance occurs during engine operation, remove the cam followers and their related parts and inspect them for excessive wear. This change in the injector timing or valve clearance during engine operation can usually be detected by excessive noise at idle speed.

(7) After the cam followers and their associated parts are removed, clean all of the parts thoroughly with fuel oil and dry them with compressed air.

(8) Inspect the push rods and push rod spring seats for wear.

(9) The current push rod has milled wrench flats and a bright "turned" finish, and the current lower spring seat is serrated along the push rod contact surface.

(10) The purpose of a push rod spring is to maintain a predetermined load on the cam follower to insure contact of the cam roller on the camshaft lobe at all times. Check the push rod spring load whenever the cam followers and their related parts are removed for inspection.

(11) The current push rod spring is made of wire .177 inch in diameter and has a free length of 2 5/8 inch. Replace the spring when a load of less than 172 lbs. will compress it to a length of 2 1/8 inch. Use spring tester J 9666 and any accurate torque wrench to check the spring load.

(12) Examine the cam follower bores in the cylinder head to make sure they are clean, smooth, and free of score marks to permit proper functioning of the cam followers. Clean up any existing score marks.

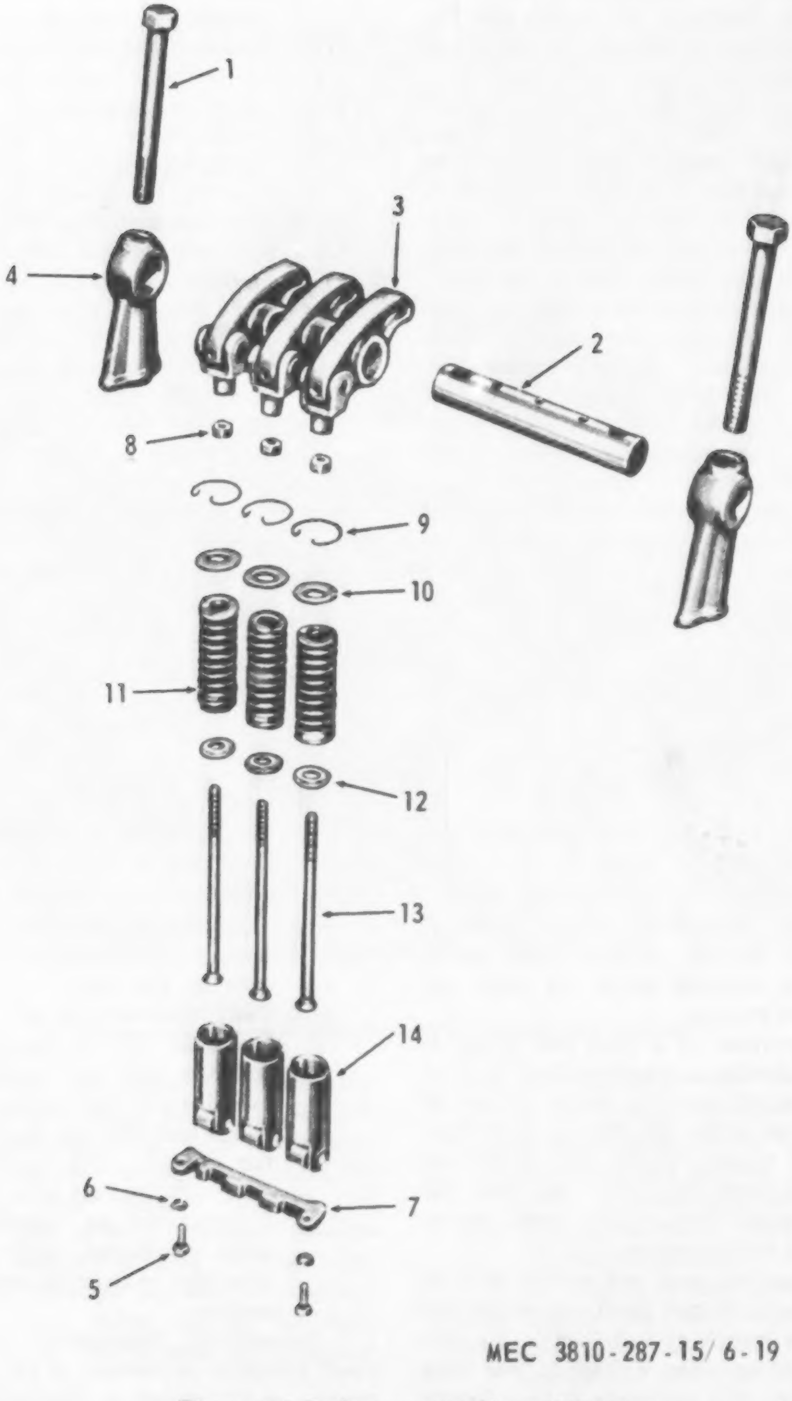
(13) The diameter of a new cam follower is 1.060 inch to 1.061 inch, and the clearance between the cam follower and cylinder head bore with new parts is .001 inch to .003 inch. With used parts, a maximum clearance of .006 inch is allowable.

(14) The cam rollers must turn smoothly and freely on their pins, and the rollers must be free from flat spots or scuff marks. If the rollers do not turn freely, or have been scored or worn flat, then examine the cams on which they operate. If the cams are excessively worn or damaged, replace the camshaft.

(15) Measure the total clearance between the roller bushing and pin, crosswise of the pin. If the bushing is worn to the extent that more than .010 inch diametric clearance exists, install a new cam roller and pin, which are serviced as a set, in the follower assembly. Also, check the total side clearance between the roller and follower; this clearance must be .015 inch to .023 inch.

(16) Cam followers that are stamped with the letter "S" on the pin, roller and follower body are equipped with an oversize pin and roller. An oversize roller and pin are available as a set for service. DO NOT attempt to bore out the legs of a standard cam follower for an oversize pin. The same clearances apply to either a standard or oversize cam follower assembly.

f. Reassembly. Reassemble the rocker arm shaft assembly in reverse of the numerical sequence as illustrated on figure 6-19.


1
2
3
4
5
6
7
8
9
10
11
12
13
14

MEC 3810-287-15/6-19

Figure 6-19. Rocker arm assembly, exploded view.

1 Bolt, rocker shaft bracket
2 Shaft
3 Rocker arm (3)
4 Bracket
5 Bolt, 1/4-20 x 3/4 (2)
6 Washer, lock, 1/4 in. (2)
7 Guide, cam follower
8 Locknut (3)
9 Retainer (3)
10 Seat, upper (3)
11 Spring (3)
12 Seat, lower (3)
13 Push rod (3)
14 Cam Follower (3)

Figure 6-19—Continued.

---

g. Installation. Refer to figure 6-18 and install the rocker arm shaft assembly.

h. Adjustment. Refer to paragraph 3-47 and adjust the rocker arm assemblies.

6-14. Cylinder Head Assembly

a. General. The cylinder head is located on top of the engine block and contains the valves, injectors and rocker arm assemblies. The cylinder head and gasket provides the top seal for the cylinders.

b. Removal. Refer to figure 6-20 and remove the cylinder head assembly.

c. Disassembly. Disassemble the cylinder head assembly in the numerical sequence as illustrated on figure 6-21.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

(2) Place a heavy accurate straight edge across cylinder head and check for transverse and longitudinal warpage. Maximum longitudinal warpage is .0055 inch, and maximum transverse warpage is .004 inch. Maximum allowable refacing of cylinder head is .020 inch.

f. Reassembly. Reassemble the cylinder head assembly in reverse of the numerical sequence as illustrated on figure 6-21.

g. Installation. Refer to figure 6-20 and install the cylinder head assembly.

6-15. Flywheel Assembly

a. General. The flywheel assembly is located in the flywheel housing and contains the flywheel ring gear. The flywheel acts as a balancer for the crankshaft and provides the mechanical connection between the starter and engine.

b. Removal.

(1) Remove the engine (para 5-26).

(2) Refer to figure 6-22 and remove the flywheel assembly.

c. Disassembly. Disassemble the flywheel assembly in the numerical sequence as illustrated on figure 6-23.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

f. Reassembly. Reassemble the flywheel assembly in reverse of the numerical sequence as illustrated on figure 6-23.

g. Installation. Refer to figure 6-22 and install the flywheel assembly.

6-16. Flywheel Housing Assembly

a. General. The flywheel housing assembly is located at the rear of the engine and attached to the engine block. It provides a housing for the flywheel and clutch assemblies, and the mounting connection for the transmission.

b. Removal.

(1) Remove the engine (para 5-26).

(2) Refer to figure 6-24 and remove the flywheel housing assembly.

c. Disassembly. Disassemble the flywheel housing assembly in the numerical sequence as illustrated on figure 6-25.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

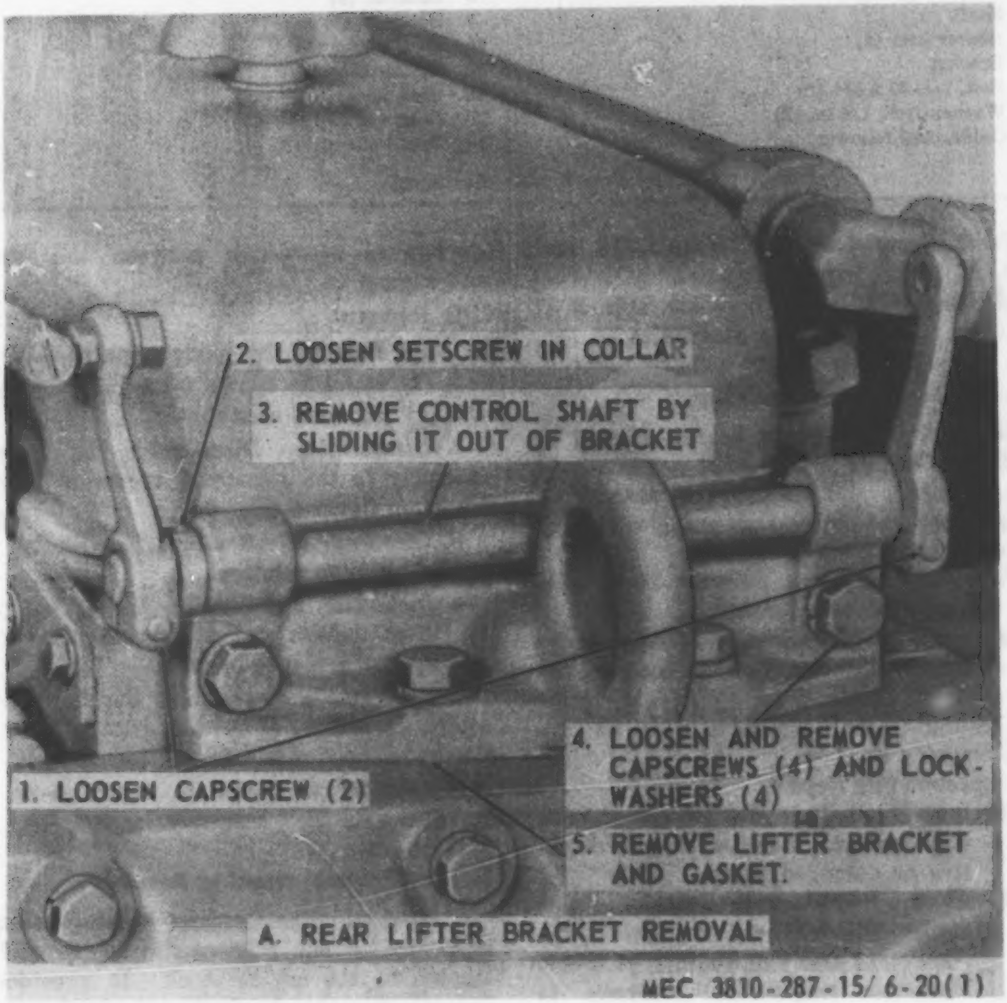

2. LOOSEN SETSCREW IN COLLAR
3. REMOVE CONTROL SHAFT BY SLIDING IT OUT OF BRACKET
1. LOOSEN CAPSCREW (2)
4. LOOSEN AND REMOVE CAPSCREWS (4) AND LOCK-WASHERS (4)
5. REMOVE LIFTER BRACKET AND GASKET.
A. REAR LIFTER BRACKET REMOVAL
MEC 3810-287-15/6-20(1)

Figure 6–20 (1). Cylinder head assembly, removal and installation.

f. Reassembly. Reassemble the flywheel assembly in reverse of the numerical sequence as illustrated on figure 6–25.

g. Installation. Refer to figure 6–24 and install the flywheel assembly.

6–17. Crankshaft Pulley and Front Cover

a. General. The crankcase pulley and front cover is located on the front of the engine. The pulley drives the alternator, pump and fan assemblies, and the front cover houses the oil pump drive gear assembly and contains the crankshaft front oil seal.

b. Removal.

(1) Remove the radiator assembly (para 3–54).

(2) Remove the alternator, pump and fan drive belts (para 3–59, 3–60 and 3–91).

(3) Refer to figure 6–26 and remove the crankshaft pulley and front cover.

c. Disassembly. Disassemble the crankshaft front cover in the numerical sequence as illustrated on figure 6–27.

d. Cleaning. Clean all parts with an approved cleaning solution.

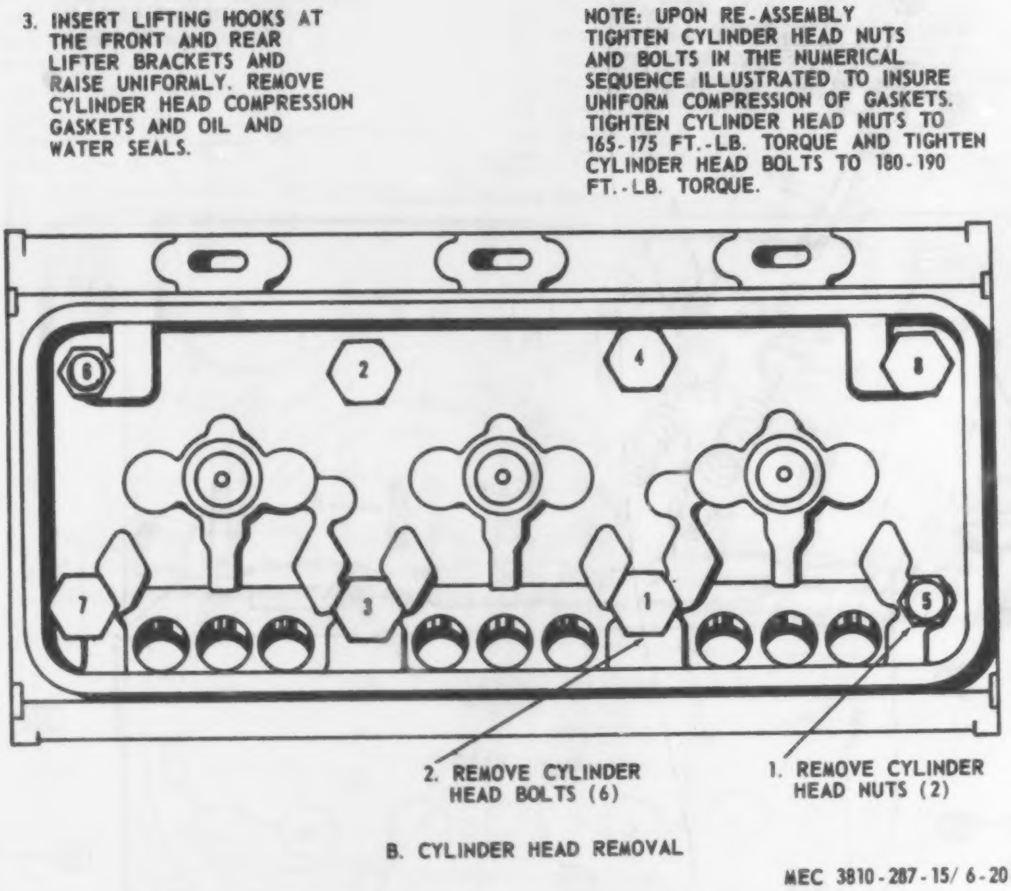

3. INSERT LIFTING HOOKS AT THE FRONT AND REAR LIFTER BRACKETS AND RAISE UNIFORMLY. REMOVE CYLINDER HEAD COMPRESSION GASKETS AND OIL AND WATER SEALS.
NOTE: UPON RE-ASSEMBLY TIGHTEN CYLINDER HEAD NUTS AND BOLTS IN THE NUMERICAL SEQUENCE ILLUSTRATED TO INSURE UNIFORM COMPRESSION OF GASKETS. TIGHTEN CYLINDER HEAD NUTS TO 165-175 FT.-LB. TORQUE AND TIGHTEN CYLINDER HEAD BOLTS TO 180-190 FT.-LB. TORQUE.
6
2
4
8
7
3
1
5
2. REMOVE CYLINDER HEAD BOLTS (6)
1. REMOVE CYLINDER HEAD NUTS (2)
B. CYLINDER HEAD REMOVAL
MEC 3810-287-15/ 6-20(2)

Figure 6-20 (2).—Continued.

e. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

f. Reassembly. Reassemble the crankshaft front cover in reverse of the numerical sequence as illustrated on figure 6-27.

g. Installation.

(1) Refer to figure 6-26 and install the crankshaft pulley and front cover.

(2) Install the alternator, pump and fan drive belts (para. 3-59, 3-60 and 3-91).

(3) Install the radiator assembly (para 3-54).

6-18. Oil Pan Assembly

a. General. The oil pan assembly is located below the engine and attached to the engine block. It houses the crankshaft, oil pump and lines, and is the reservoir for the engine oil supply.

b. Removal.

(1) Remove the engine (para 5-26).

(2) Refer to figure 6-28 and remove the oil pan assembly.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

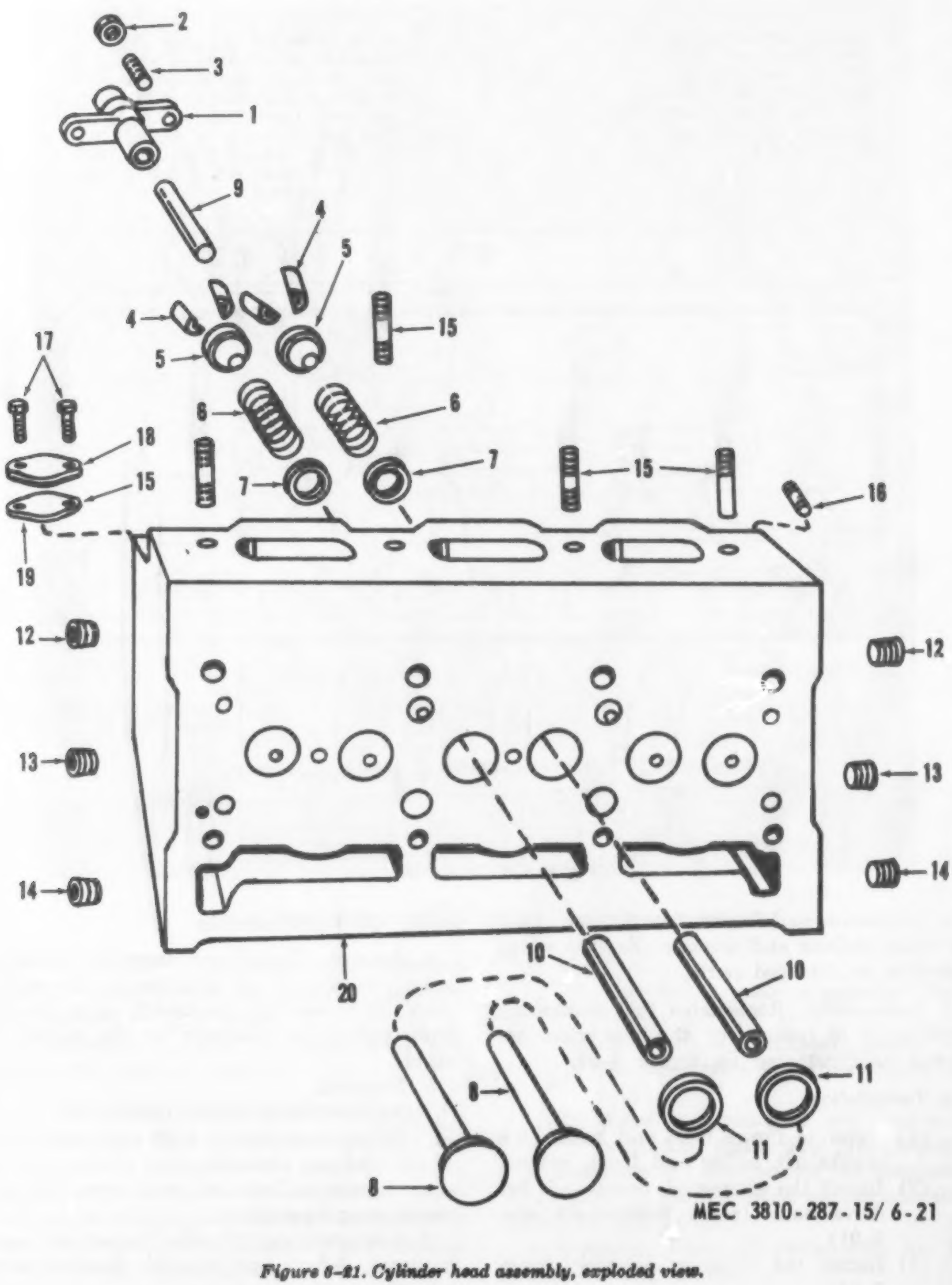
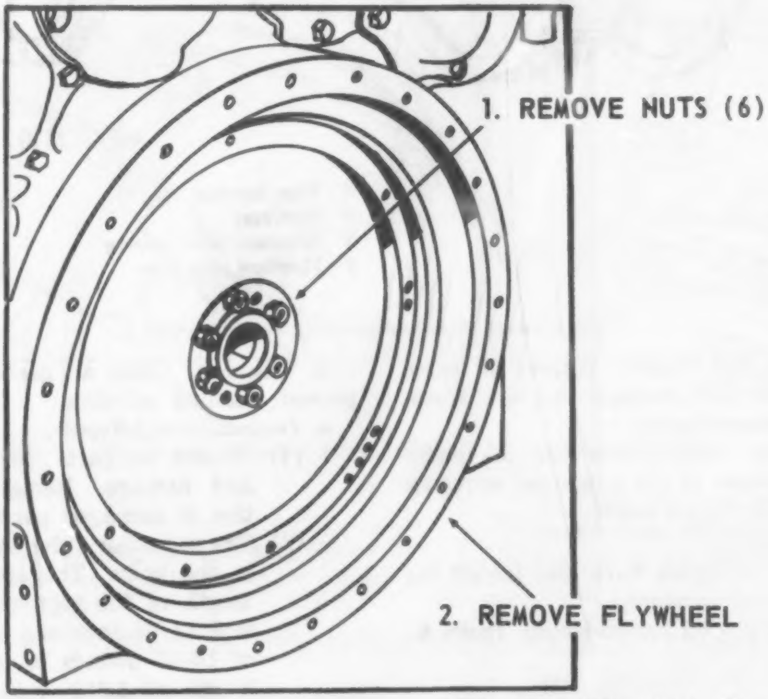

2
3
1
9
4
5
4
5
15
17
6
6
18
15
7
7
15
15
16
19
12
12
13
13
14
14
20
10
10
11
8
11
8
MEC 3810-287-15/6-21

Figure 6-21. Cylinder head assembly, exploded view.

1 Exhaust valve bridge (3)
2 Nut, exhaust valve bridge adjusting (3)
3 Screw, exhaust valve bridge adjusting (3)
4 Lock, exhaust valve spring (12)
5 Seat, exhaust valve spring (6)
6 Spring (6)
7 Seat, exhaust valve spring (6)
8 Valve, exhaust (6)
9 Guide, exhaust valve bridge (3)
10 Guide, valve (6)
11 Seat, valve (6)
12 Plug, pipe, 1/4 in. (2)
13 Plug, pipe, socket hd. 1/4 in. x .320 (2)
14 Plug, pipe, 3/4 in. (2)
15 Stud, exhaust manifold (4)
16 Stud, water outlet manifold (8)
17 Bolt, 1/4 in.-20 x 1/2 in. lg. (4)
18 Cover (2)
19 Gasket (2)
20 Cylinder head

Figure 6-21—Continued.



MEC 3810-287-15/ 6-22

Figure 6-22. Flywheel assembly, removal and installation.

e. *Installation.*

(1) Refer to figure 6-28 and install the oil pan assembly.

(2) Install the engine (para 5-26).

6-19. Oil Pump Assembly

a. *General.* The oil pump assembly is located in the oil pan assembly and attached to the engine block. It is driven by the crankshaft gear and supplies oil to all moving parts within the engine.

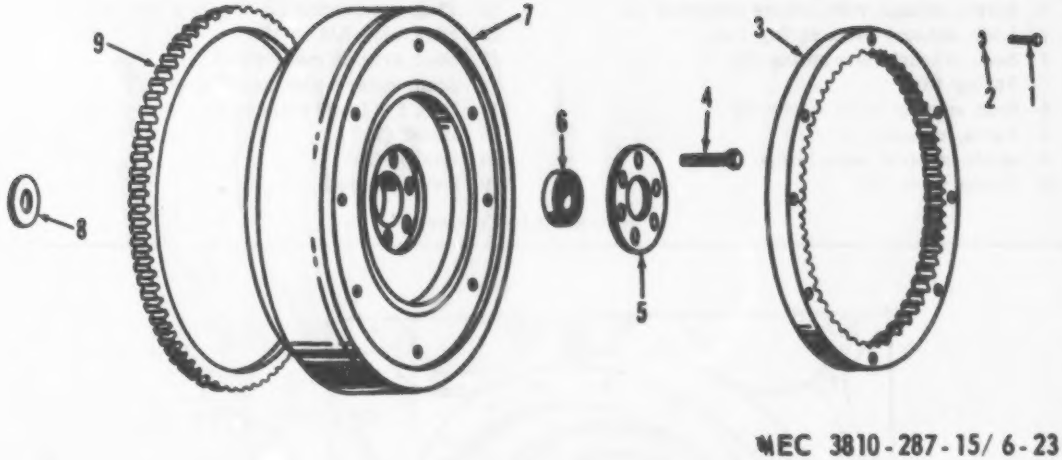
b. *Removal.*

(1) Remove the oil pan assembly (para 6-18).

(2) Refer to figure 6-29 and remove the oil pump assembly.

c. *Disassembly.* Disassemble the oil pump assembly in the numerical sequence as illustrated on figure 6-30.

d. *Cleaning.* Clean all parts with an approved cleaning solution.



1 Screw, cap (8)
2 Washer, lock (8)
3 Gear, clutch
4 Bolt, flywheel (6)
5 Retainer, pilot bearing
6 Pilot bearing
7 Flywheel
8 Retainer, pilot bearing
9 Flywheel ring gear

Figure 6–28. Flywheel assembly, exploded view.

e. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

f. Reassembly. Reassemble the oil pump assembly in reverse of the numerical sequence as illustrated on figure 6–30.

g. Installation.

(1) Refer to figure 6–29 and install the oil pump assembly.

(2) Install the oil pan assembly (para 6–18).

6–20. Oil Pressure Regulator

a. General. The oil pressure regulator is located in the lower front section of the engine and attached to the engine block. It controls the pressure from the engine oil pump to maintain a constant pressure.

b. Removal.

(1) Remove the engine oil pan (para 6–18).

(2) Refer to figure 6–31 and remove the oil pressure regulator.

c. Disassembly. Disassemble the oil pressure regulator in the numerical sequence as illustrated on figure 6–32.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair.

(1) Inspect all parts for wear, defect and damage. Replace worn, defective or damaged parts.

(2) The regulator valve must move freel in the body. The approximate fre length of the regulator valve sprin is 2 31/64 inch and requires a forc of 14–15 pounds to compress it to length of 1.656 inch. Use sprin tester J 5237 to check spring tension.

f. Reassembly. Reassemble the oil pressur regulator in reverse of the numerical sequenc as illustrated on figure 6–32.

g. Installation.

(1) Refer to figure 6–31 and install th oil pressure regulator.

(2) Install the engine oil pan (para 6-18).

6–21. Pistons, Pins, and Connecting Rods

a. General. The pistons, pins and connecting rods are located in the engine cylinde block and attached to the crankshaft.

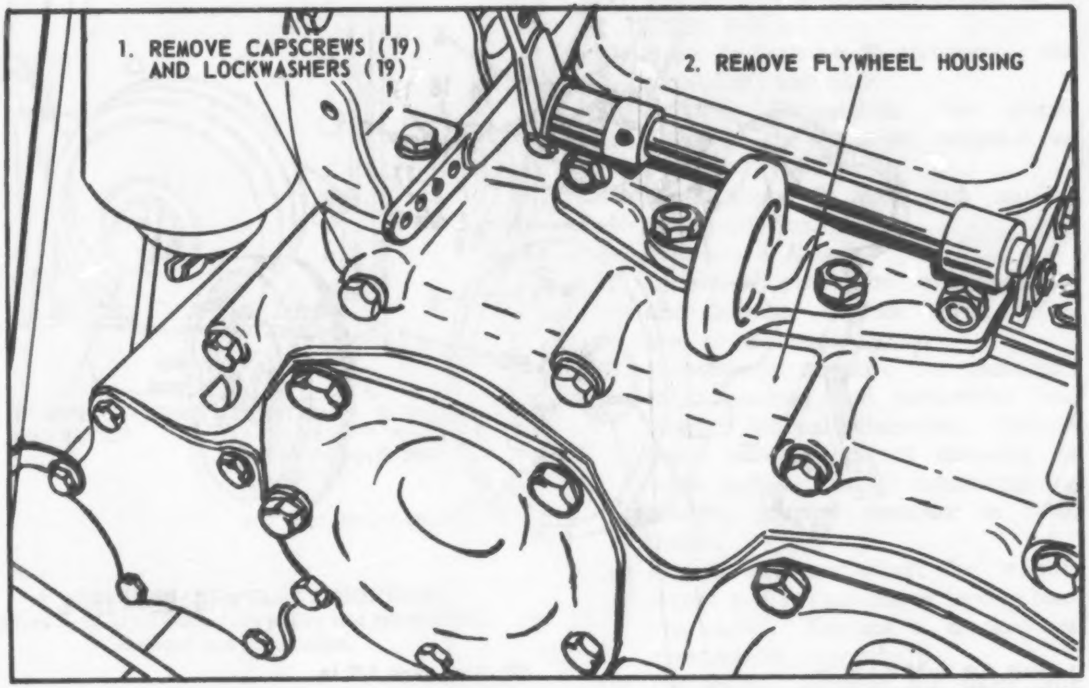

1. REMOVE CAPSCREWS (19) AND LOCKWASHERS (19)
2. REMOVE FLYWHEEL HOUSING
MEC 3810-287-15/6-24

Figure 6-24. Flywheel housing assembly, removal and installation.

b. Removal.

(1) Remove the engine (para 5-26).

(2) Remove the engine cylinder head (para 6-14).

(3) Remove the engine oil pan (para 6-18).

(4) Remove the engine oil pump assembly (para 6-19).

(5) Remove the engine oil pressure regulator (para 6-20).

(6) Refer to figure 6-33 and remove the piston and connecting rod assemblies.

c. Disassembly. Disassemble the piston and connecting rod assemblies in the numerical sequence as illustrated on figure 6-34.

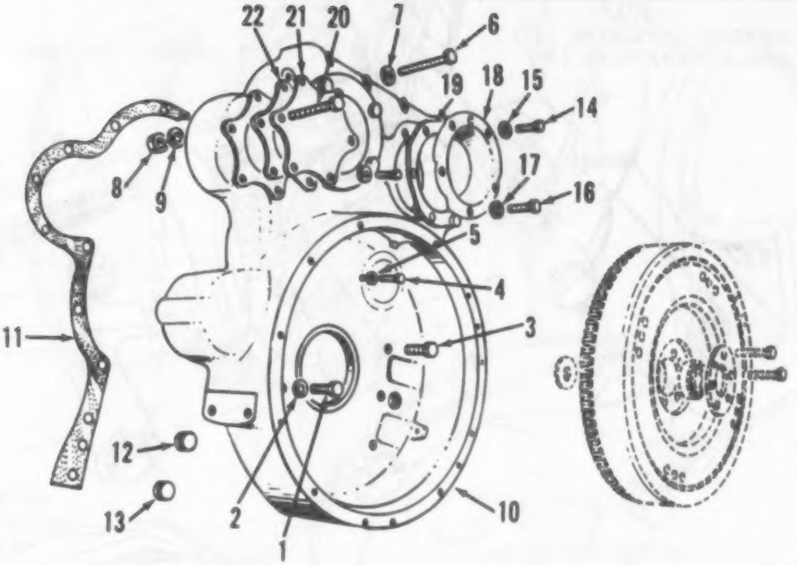
d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair.

(1) Inspect the pistons for signs of wear, defects and damage. If the tin plate on the piston and the original grooves on the piston rings are intact, it is an indication of very little wear.

(2) Inspect and measure the piston pin bushings. Correct dimension with new bushings is 1.5025 to 1.5030 inch. Correct piston pin diameter is 1.4996 to 1.5000 inch. Pin-to-bushing clearance is .0025 to .0034 inch for new parts, and a maximum allowable clearance of .010 inch for used parts.

(3) Inspect and measure the piston outside diameter. Correct dimension for a new piston is 4.2190 to 4.2220 inches at the top, and 4.2433 to 4.2455 inches at the bottom (below compression ring grooves to bottom). The maximum allowable out-of-round is .0005 in. The maximum allowable taper is .0005 in.



3810-287-15/6

1	Bolt, 3/8 in.-16 x 1 in. lg.
2	Washer, lock, 3/8 in.
3	Bolt, 3/8 in.-16 x 1 1/4 in. lg.
4	Bolt, 1/2 in.-13 x 3/4 in. lg.
5	Washer, lock, 1/2 in.
6	Bolt, 3/8 in.-24 x 3 1/2 in.
7	Washer, flat, 3/8 in.
8	Nut, 3/8 in.-24
9	Washer, lock, 3/8 in.
10	Housing
11	Gasket
12	Plug, pipe, 1/2 in.
13	Plug, pipe, 3/4 in.
14	Bolt, 7/16 in.-14 x 7/8 in. lg. (2)
15	Washer, lock, 7/16 in. (2)
16	Bolt, 1/2 in.-13 x 1 1/8 in. lg. (3)
17	Washer, lock, 1/2 in. (3)
18	Cover
19	Gasket
20	Bolt, 3/8 in.-16 x 7/8 in. lg. (3)
21	Cover
22	Gasket

Figure 6-35. Flywheel housing assembly, exploded view.

(4) Inspect the connecting bearings for wear and damage. Replace worn or damaged bearings.

(5) Inspect and measure the pin bushing. Correct dimension with new bushing is 1.5015 to 1.5020 in. This provides a desired clearance between pin and bushing of .0015 to .0024 inches. Replace worn or damaged bushings.

f. Reassembly. Reassemble the piston and connecting rod assemblies in reverse of the numerical sequence as illustrated on figure 6-34.

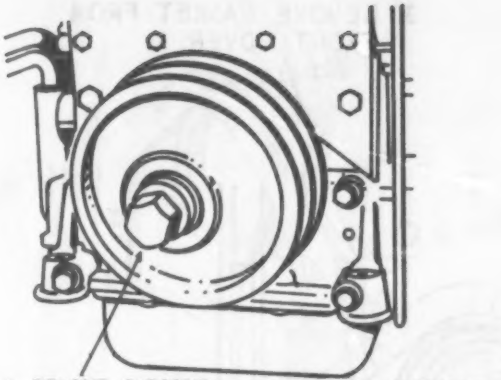
g. Installation.

(1) Refer to figure 6-33 and install the piston and connecting rod assemblies.

(2) Install the oil pressure regulator (para 6-20).

(3) Install the oil pump assembly (para 6-19).

(4) Install the engine oil pan assembly (para 6-18).


1. REMOVE CAPSCREW AND WASHER
2. ATTACH A SUITABLE PULLER TO PULLEY AND REMOVE PULLEY AND KEY
MEC 3810-287-15/6-26 (1)

A. CRANKSHAFT PULLEY REMOVAL

Figure 6-26 (1). Crankshaft pulley and front cover, removal and installation.

(5) Install the engine cylinder head (para 6-14).

(6) Install the engine (para 5-26).

6-22. Crankshaft Assembly

a. General. The crankshaft assembly is located in the lower part of the engine and attached to the engine block. The crankshaft transmits power from the pistons to the flywheel and clutch assembly.

b. Removal.

(1) Remove the engine (para 5-26).

(2) Remove the engine oil pan (para 6-18).

(3) Remove the oil pump assembly (para 6-19).

(4) Remove the oil pressure regulator (para 6-20).

(5) Remove the engine cylinder head (para 6-14).

(6) Remove the piston and connecting rod assemblies (para 6-21).

(7) Remove the flywheel assembly (para 6-15).

(8) Remove the flywheel housing (para 6-16).

(9) Remove the crankshaft front cover (para 6-17).

(10) Refer to figure 6-35 and remove the crankshaft assembly.

c. Disassembly. Disassemble the crankshaft assembly in the numerical sequence as illustrated on figure 6-36.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

(2) Inspect and measure the crankshaft main bearing and connecting rod bearing journal diameters. Correct main bearing journal diameter is 3.500 inches. Correct connecting rod bearing journal diameter is 2.750 inches.

(3) Inspect the crankshaft for minute cracks and indications of having been overheated. Replace a cracked or questionable crankshaft.

(4) Inspect all bearings for wear and damage. Replace worn or damaged bearings.

f. Reassembly. Reassemble the crankshaft assembly in reverse of the numerical sequence as illustrated on figure 6-36.

g. Installation.

(1) Refer to figure 6-35 and install the crankshaft assembly.

Note. Check the crankshaft end play. Correct clearance is .004 to .011 in. with new parts and a maximum of .018 inch with used parts.

(2) Install the crankshaft front cover (para 6-17).

(3) Install the flywheel housing (para 6-16).

(4) Install the flywheel (para 6-15).

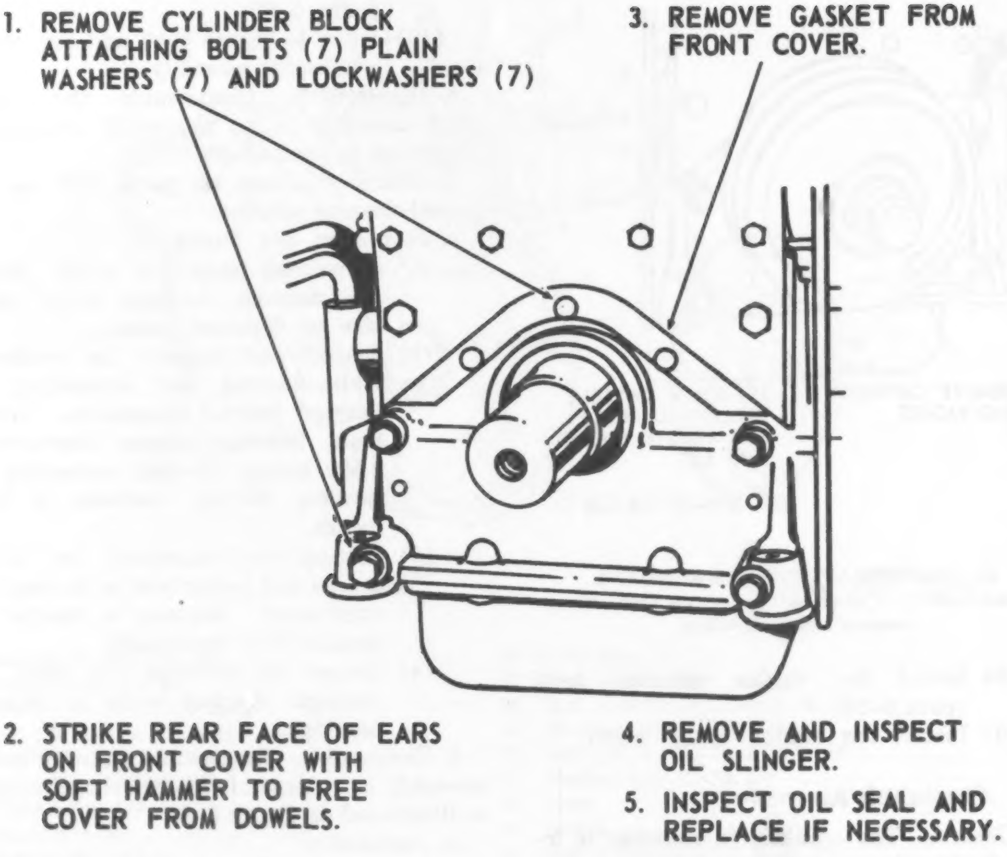
(5) Install the piston and connecting rod assemblies (para 6-21).

(6) Install the engine oil pump (para 6-19).

(7) Install the oil pressure regulator (para 6-20).

(8) Install the engine oil pan (para 6-18).

(9) Install the cylinder head (para 6-14).


1. REMOVE CYLINDER BLOCK ATTACHING BOLTS (7) PLAIN WASHERS (7) AND LOCKWASHERS (7)
3. REMOVE GASKET FROM FRONT COVER.
2. STRIKE REAR FACE OF EARS ON FRONT COVER WITH SOFT HAMMER TO FREE COVER FROM DOWELS.
4. REMOVE AND INSPECT OIL SLINGER.
5. INSPECT OIL SEAL AND REPLACE IF NECESSARY.

B. FRONT COVER REMOVAL

MEC 3810-287-15/6-26(2)

Figure 6-26 (2).—Continued.

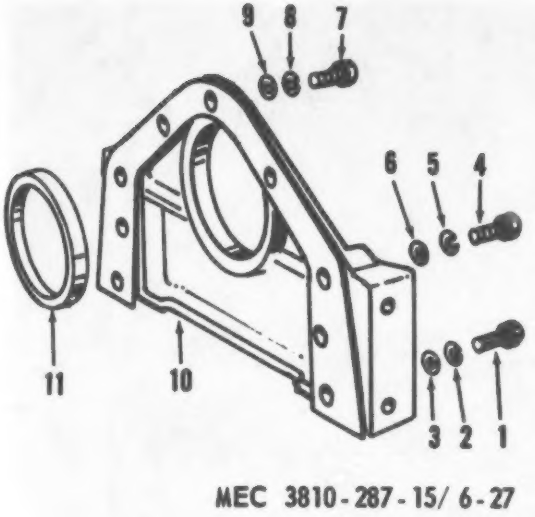
(10) Install the engine (para 5-26).

6-23. Balance Weight Cover

a. General. The balance weight cover is located on the front of the engine and encloses the balance weights. It also acts as a suppo for mounting the cooling fan and other a cessories.

b. Removal.

(1) Remove the radiator assembly (pa 3-54).



1 Bolt, 1/2 in.-13 x 3 3/4 in. lg. (2)
2 Washer, lock, 1/2 in. (2)
3 Washer, flat, 1/2 in. (2)
4 Bolt, 1/2 in.-13 x 2 1/4 in. lg. (2)
5 Washer, lock, 1/2 in. (2)
6 Washer, flat, 1/2 in. (2)
7 Bolt, 3/8 in.-24 x 3/4 in. lg. (3)
8 Washer, lock, 3/8 in. (3)
9 Washer, flat, 3/8 in. (3)
10 Crankshaft front cover
11 Seal, oil

Figure 6-37. Crankshaft front cover, exploded view.

(2) Remove the fan assembly (para 3-58).

(3) Remove the front lifter bracket (para 6-14).

(4) Refer to figure 6-37 and remove the balance weight cover.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for defects and damage. Replace defective or damaged parts.

e. Installation.

(1) Refer to figure 6-37 and install the balance weight cover.

(2) Install the front lifter bracket (para 6-14).

(3) Install the fan assembly (para 3-58).

(4) Install the radiator assembly (para 3-54).

6-24. Camshaft and Balance Shaft

a. General. The camshaft and balance shaft is located in the top of the engine block on either side of the cylinders. The camshaft opens and closes the exhaust valves and actuates the injectors. The balance shaft acts as a counterweight to reduce vibration.

b. Removal.

(1) Remove the engine (para 5-26).

(2) Remove the cylinder head (para 6-14).

(3) Remove the flywheel (para 6-15).

(4) Remove the flywheel housing (para 6-16).

(5) Remove the front balance weight cover (para 6-23).

(6) Refer to figure 6-38 and remove the camshaft and balance shaft.

c. Disassembly. Disassemble the camshaft and balance shaft in the numerical sequence as illustrated on figure 6-39.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

f. Reassembly. Reassemble the camshaft and balance shaft in reverse of the numerical sequence as illustrated on figure 6-39.

g. Installation.

(1) Refer to figure 6-38 and install the camshaft and balance shaft.

(2) Install the front balance weight cover (para 6-23).

(3) Install the flywheel housing (para 6-16).

(4) Install the flywheel (para 6-15).

(5) Install the cylinder head (para 6-14).

(6) Install the engine (para 5-26).

6-25. Cylinder Liners

a. General. The cylinder liners used in the engine are a replaceable type and are a press fit in the cylinder block. Compression is sealed on each cylinder by individual gaskets.

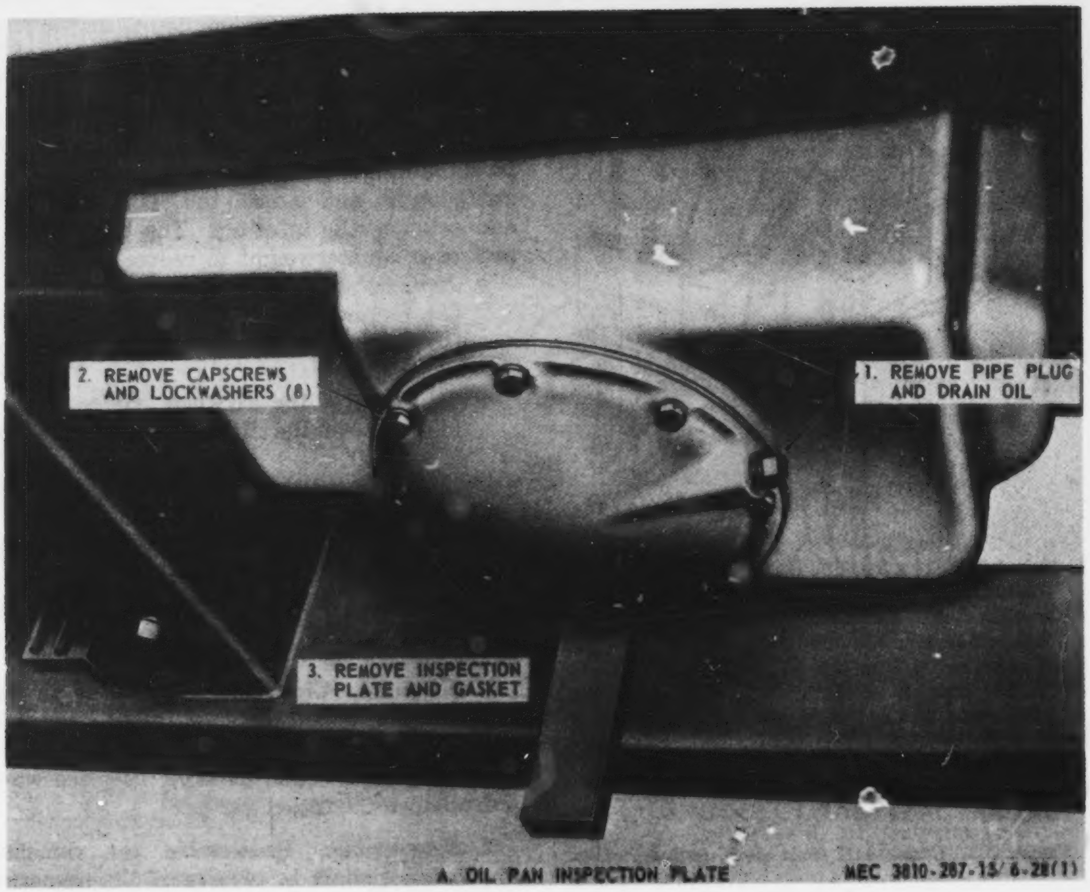

2. REMOVE CAPSCREWS AND LOCKWASHERS (8)
1. REMOVE PIPE PLUG AND DRAIN OIL
3. REMOVE INSPECTION PLATE AND GASKET
A. OIL PAN INSPECTION PLATE
MEC 3810-287-15/6-28(1)

Figure 6-28 (1). Oil pan assembly, removal and installation.

b. Removal.

(1) Remove the engine (para 5-26).

(2) Remove the pistons and connecting rods (para 6-21).

(3) Refer to figure 6-40 and remove the cylinder liners.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

(2) Inspect and measure the liner inside diameter. Correct dimension is 4.2495 to 4.2511 inches.

(3) Measure the liner inside diameter at various points and determine maximum out-of-round and taper dimensions. Maximum allowable out-of-round is .003 inch. Maximum allowable taper is .002 inch. Replace badly worn or damaged liners.

(4) Inspect and measure the engine block cylinder liner bore. Correct dimension is 4.6250 to 4.6260 inches. If cylinder bore is worn beyond these limits, the block must be rebored for oversize liners.

e. Installation.

(1) Refer to figure 6-40 and install the cylinder liners.

Note. After installation of the liners, check the top liner surface with a dial indicator. Liners must be recessed below the cylinder block .0465 to .0500 inch.

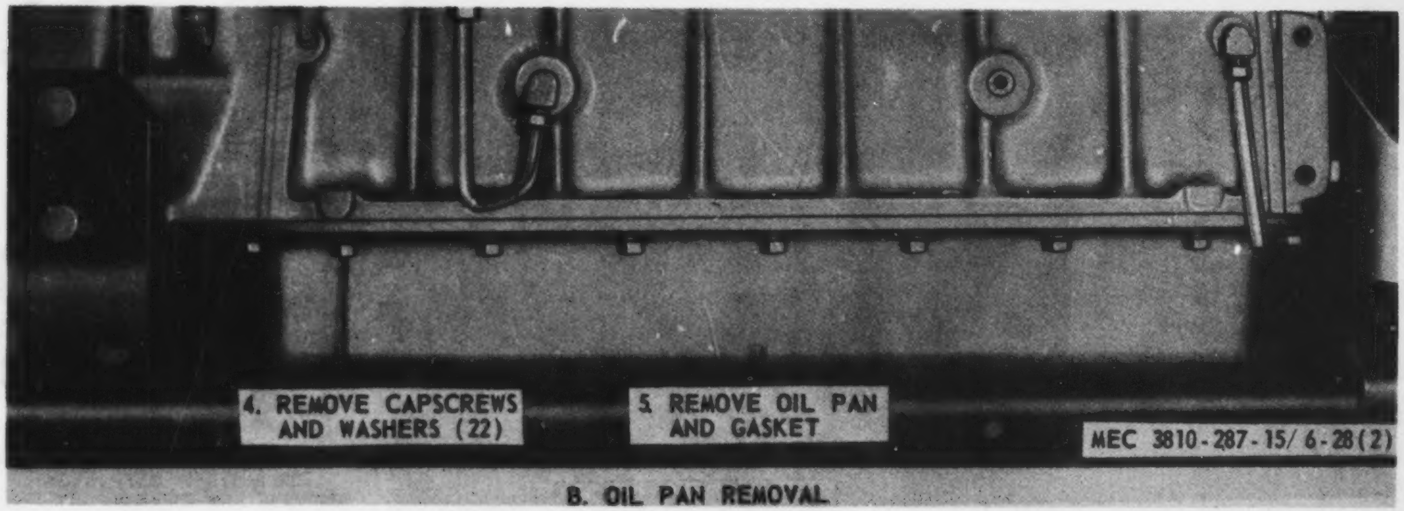

4. REMOVE CAPSCREWS AND WASHERS (22)
5. REMOVE OIL PAN AND GASKET
MEC 3810-287-15/6-28(2)
B. OIL PAN REMOVAL

Figure 6-28 (2).—Continued.

best copy available

Reproduced from poor document.

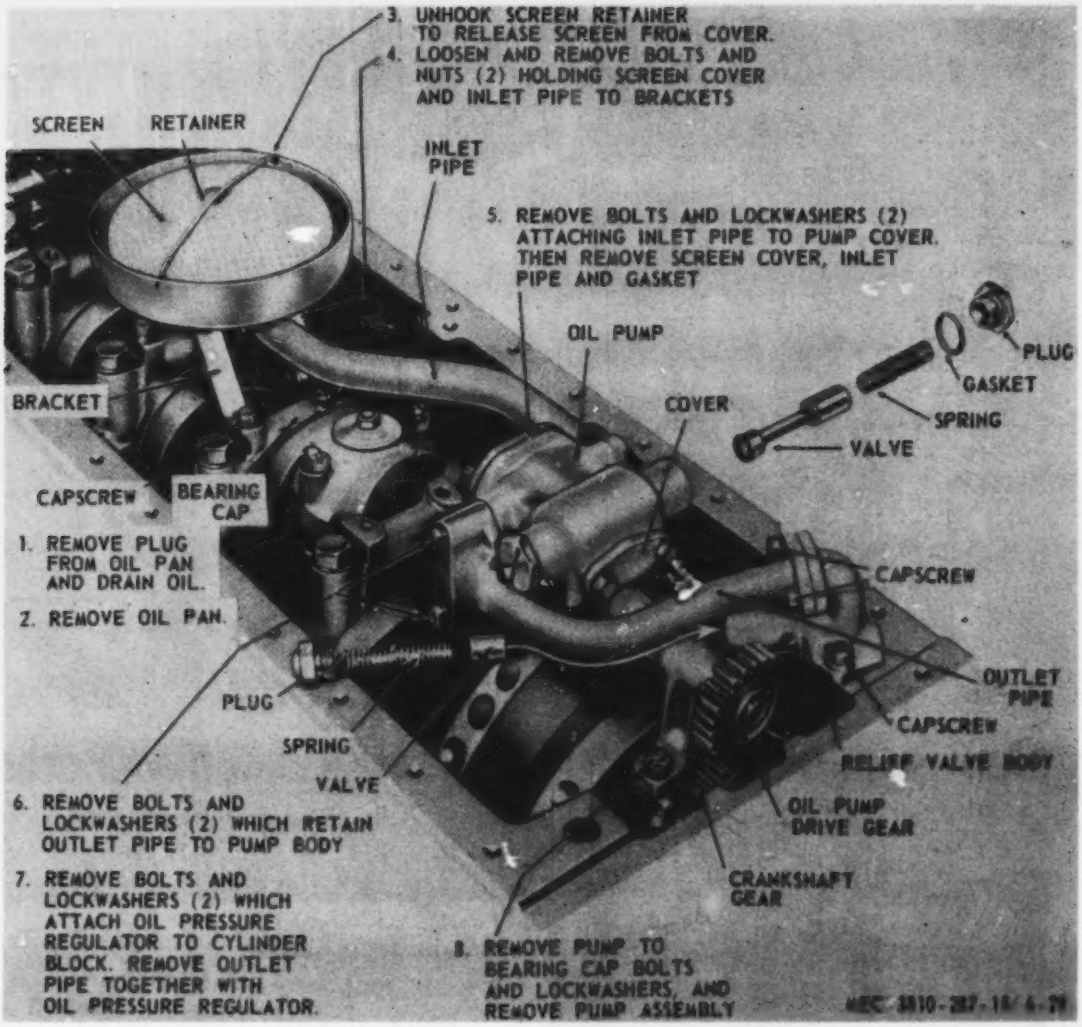

3. UNHOOK SCREEN RETAINER TO RELEASE SCREEN FROM COVER.
4. LOOSEN AND REMOVE BOLTS AND NUTS (2) HOLDING SCREEN COVER AND INLET PIPE TO BRACKETS
SCREEN
RETAINER
INLET PIPE
5. REMOVE BOLTS AND LOCKWASHERS (2) ATTACHING INLET PIPE TO PUMP COVER. THEN REMOVE SCREEN COVER, INLET PIPE AND GASKET
OIL PUMP
PLUG
GASKET
SPRING
VALVE
COVER
BRACKET
CAPSCREW
BEARING CAP
1. REMOVE PLUG FROM OIL PAN AND DRAIN OIL.
2. REMOVE OIL PAN.
CAPSCREW
OUTLET PIPE
CAPSCREW
PLUG
SPRING
VALVE
RELIEF VALVE BODY
6. REMOVE BOLTS AND LOCKWASHERS (2) WHICH RETAIN OUTLET PIPE TO PUMP BODY
OIL PUMP DRIVE GEAR
CRANKSHAFT GEAR
7. REMOVE BOLTS AND LOCKWASHERS (2) WHICH ATTACH OIL PRESSURE REGULATOR TO CYLINDER BLOCK. REMOVE OUTLET PIPE TOGETHER WITH OIL PRESSURE REGULATOR.
8. REMOVE PUMP TO BEARING CAP BOLTS AND LOCKWASHERS, AND REMOVE PUMP ASSEMBLY
MEC 3810-287-15/6-39

Figure 6–39. Oil pump assembly, removal and installation.

(2) Install the piston and connecting rods (para 6–21).

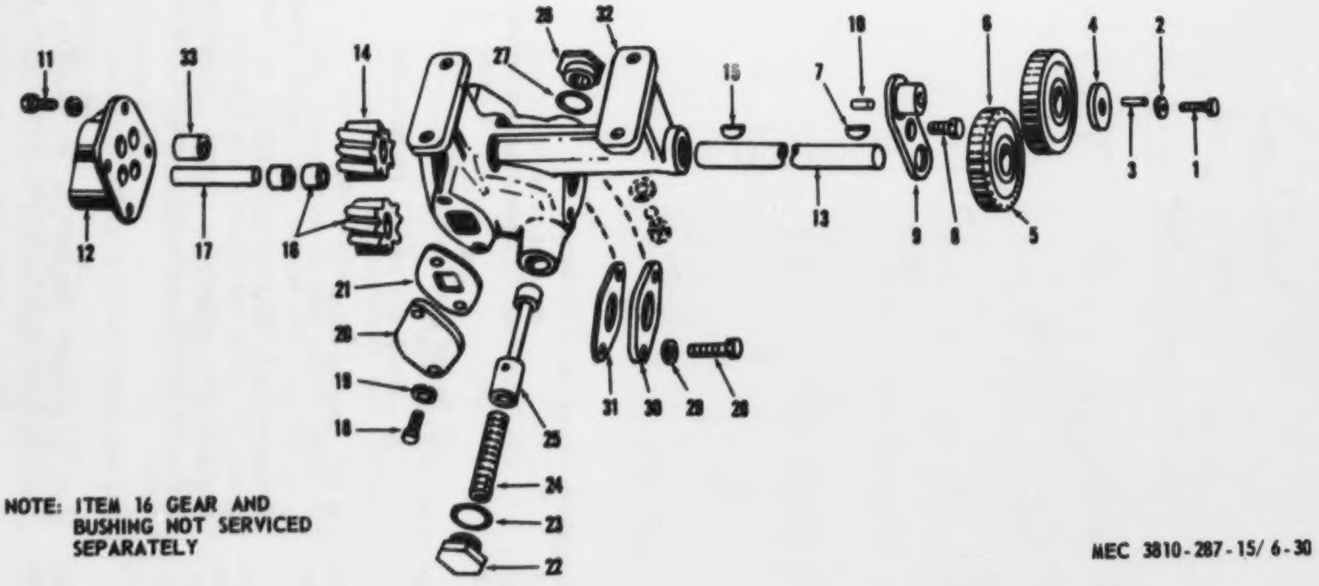
(3) Install the engine (para 5–26).

6–26. Timing Gears

a. General. The timing gear train is located at the rear of the engine and enclosed by the flywheel housing. The timing gears synchronize the crankshaft with the camshaft to open and close the exhaust valves and actuate the injectors at the proper time for combustion.

b. Removal.

(1) Remove the engine (para 5–26).
(2) Remove the flywheel housing (para 6–16).
(3) Refer to figure 6–41 and remove the timing gears.


11
33
14
12
17
16
21
20
19
18
27
26
32
15
10
7
6
4
2
1
3
13
9
8
5
25
24
23
22
31
30
29
28
NOTE: ITEM 16 GEAR AND BUSHING NOT SERVICED SEPARATELY
MEC 3810-287-15/ 6-30

1	Bolt, 5/16 in.-18 x 7/8 in. lg.
2	Washer, small
3	Pin, groove, 1/8 x 3/8 in.
4	Washer, large
5	Gear assembly
6	Gear, oil pump drive
7	Key, woodruff, 1/8 x 5/8 in.
8	Bolt, 3/8 in.-16 x 7/8 in. lg.
9	Support
10	Dowel
11	Bolt, 5/16 in.-18 x 1 1/4 in. lg. (4)
12	Cover assembly
13	Shaft, oil pump drive
14	Gear, oil pump drive
15	Key, woodruff, 1/8 x 5/8 in.
16	Gear assembly, driven
17	Shaft, oil pump driven gear
18	Bolt, 5/16 in.-18 x 3/4 in. lg. (2)
19	Washer, lock, 5/16 in. (2)
20	Cover
21	Gasket
22	Plug, oil pump relief valve
23	Gasket
24	Spring
25	Valve, oil pump relief
26	Plug, oil pump relief valve
27	Gasket
28	Bolt, 5/16 in.-18 x 3/4 in. lg. (2)
29	Washer, lock, 5/16 in. (2)
30	Cover
31	Gasket
32	Body

Figure 6–30. Oil pump assembly, exploded view.

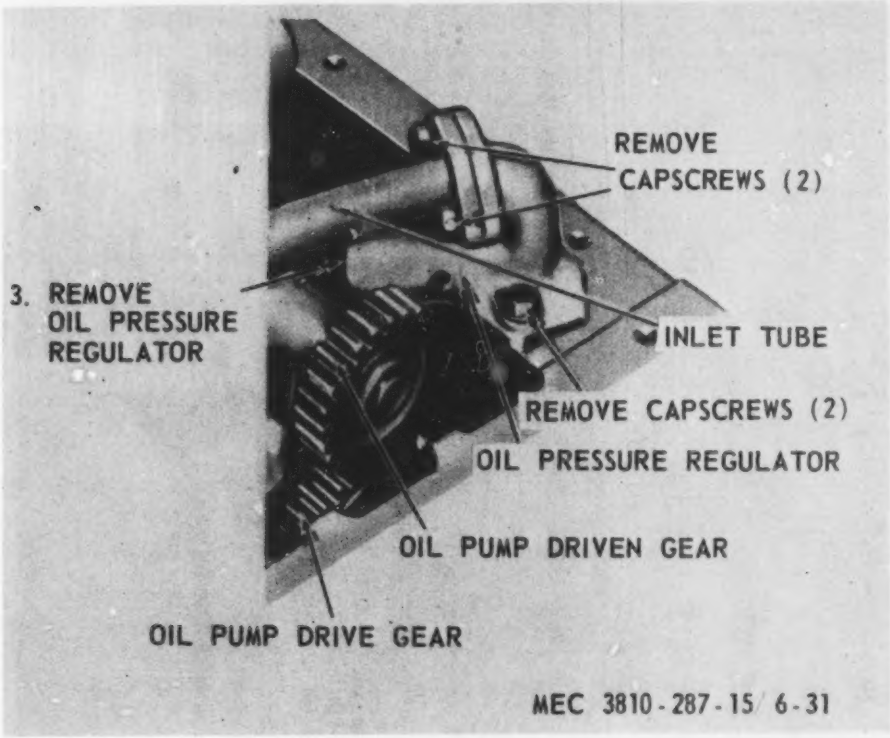

REMOVE CAPSCREWS (2)
3. REMOVE OIL PRESSURE REGULATOR
INLET TUBE
REMOVE CAPSCREWS (2)
OIL PRESSURE REGULATOR
OIL PUMP DRIVEN GEAR
OIL PUMP DRIVE GEAR
MEC 3810-287-15/ 6-31

Figure 6–31. Oil pressure regulator, removal and installation.

c. *Disassembly.* Disassemble the idler gear in the numerical sequence as illustrated on figure 6–42.

d. *Cleaning.* Clean all parts with an approved cleaning solution.

e. *Inspection and Repair.*

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

(2) Inspect the gears for wear, pitting, and damaged or broken teeth. Replace worn, pitted or damaged teeth.

(3) Inspect the bearings for wear, pitting and damage. Replace worn, pitted or damaged bearings.

f. *Reassembly.* Reassemble the idler gear in reverse of the numerical sequence as illustrated on figure 6–42.

g. *Installation.*

(1) Refer to figure 6–41 and install the timing gears.

(2) Install the flywheel housing (para 6–16).

(3) Install the flywheel (para 6–15).

(4) Install the engine (para 5–26).

6–27. Engine Block

a. *General.* The engine block is the central component of the engine inasmuch as practically all other components are attached. It contains the cylinders, pistons, connecting rods, crankshaft and other engine components.

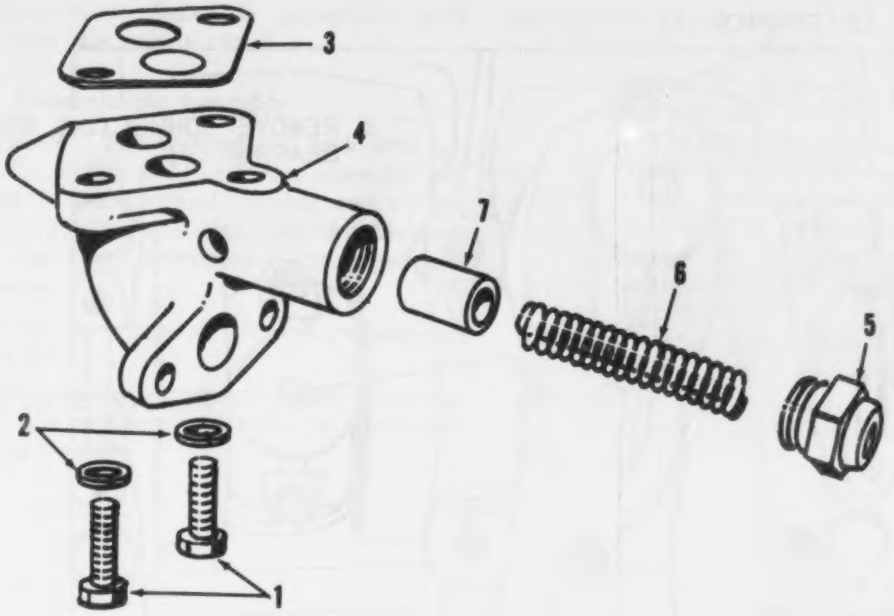
b. *Removal.*

(1) Remove the engine (para 5–26).

(2) Remove the cylinder head (para 6–14).

(3) Remove the pistons and connecting rods (para 6–21).

(4) Remove the crankshaft (para 6–22).



MEC 3810-287-15/6-32

1 Bolt, 5/16 in.-18 x 1 in. lg. (2)	5 Plug
2 Washer, lock, 5/16 in. (2)	6 Spring
3 Gasket	7 Valve
4 Body	

Figure 6-32. Oil pressure regulator, exploded view.

(5) Remove the camshaft and balance shaft (para 6-24).

(6) Remove the timing gears (para 6-26).

(7) Remove the cylinder liners (para 6-25).

c. Disassembly. Disassemble the engine block in the numerical sequence as illustrated on figure 6-43.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

f. Reassembly. Reassemble the cylinder block in reverse of the numerical sequence as illustrated on figure 6-43.

g. Installation.

(1) Install the cylinder liners (para 6-25).

(2) Install the crankshaft (para 6-22).

(3) Install the pistons and connecting rods (para 6-21).

(4) Install the camshaft and balance shaft (para 6-24).

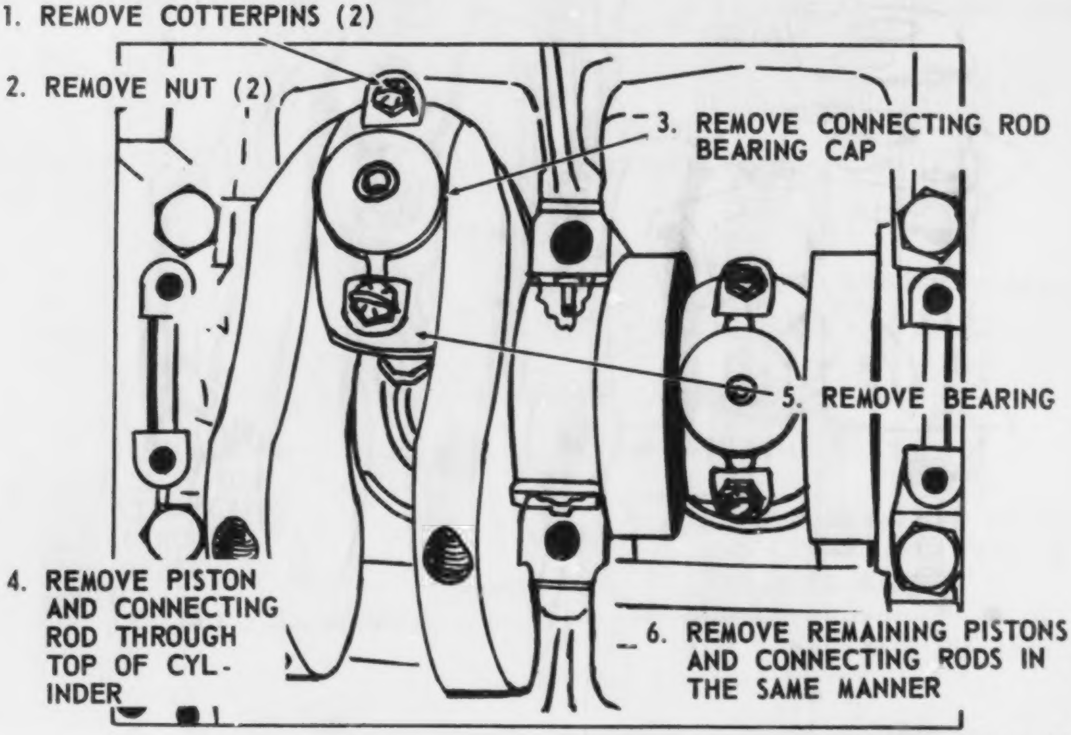
(5) Install the timing gears (para 6-26).

(6) Install the cylinder head (para 6-14).

(7) Install the flywheel housing (para 6-16).

(8) Install the flywheel (para 6-15).

(9) Install the engine (para 5-26).


1. REMOVE COTTERPINS (2)
2. REMOVE NUT (2)
3. REMOVE CONNECTING ROD BEARING CAP
4. REMOVE PISTON AND CONNECTING ROD THROUGH TOP OF CYLINDER
5. REMOVE BEARING
6. REMOVE REMAINING PISTONS AND CONNECTING RODS IN THE SAME MANNER

MEC 3810-287-15/6-33

Figure 6–33. Piston and connecting rod assemblies, removal and installation.

6–28. Engine Clutch Assembly

a. General. The engine clutch assembly is located between the engine and transmission and mounted on the flywheel and transmission input shaft. The clutch assembly provides the mechanical connection between the engine and machinery.

b. Removal.

(1) Remove the transmission (para 5–25).

(2) Refer to figure 6–44 and remove the clutch assembly.

c. Disassembly. Disassemble the engine clutch assembly in the numerical sequence as illustrated on figure 6–45.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

(2) Inspect the clutch discs and lining for wear and damage. Replace worn or damaged discs and lining.

(3) Inspect the clutch throw-out bearing and pilot bearing for wear and damage. Replace worn or damaged bearings.

f. Reassembly. Reassemble the engine clutch assembly in reverse of the numerical sequence as illustrated on figure 6–45.

g. Installation.

(1) Refer to figure 6–44 and install the engine clutch assembly.

(2) Install the transmission (para 5-25).

h. Adjustment. Refer to paragraph 3-16 and adjust the engine clutch.

6-29. Transmission Assembly

a. General. The transmission is located between the engine and chain case assembly and attached to the flywheel housing and turntable bed. The transmission provides the necessary gear reduction between the engine and machinery.

b. Removal. Remove the transmission (para 5-25).

c. Disassembly. Disassemble the transmission in the numerical sequence as illustrated on figure 6-46.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair.

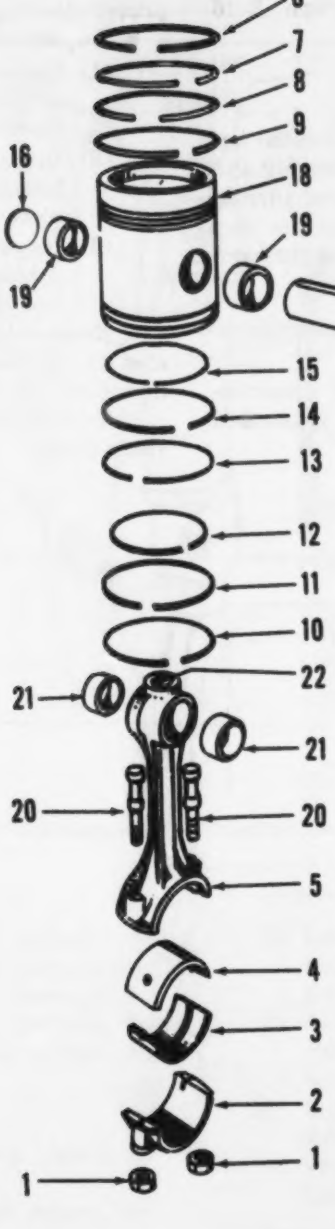
(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

(2) Inspect all gears for wear, cracked or broken teeth and other damage. Replace worn or damaged gears.

(3) Inspect all bearings for wear and damage. Replace worn or damaged bearings.

f. Reassembly. Reassemble the transmission in reverse of the numerical sequence as illustrated on figure 6-46.

g. Installation. Install the transmission (para 5-25).

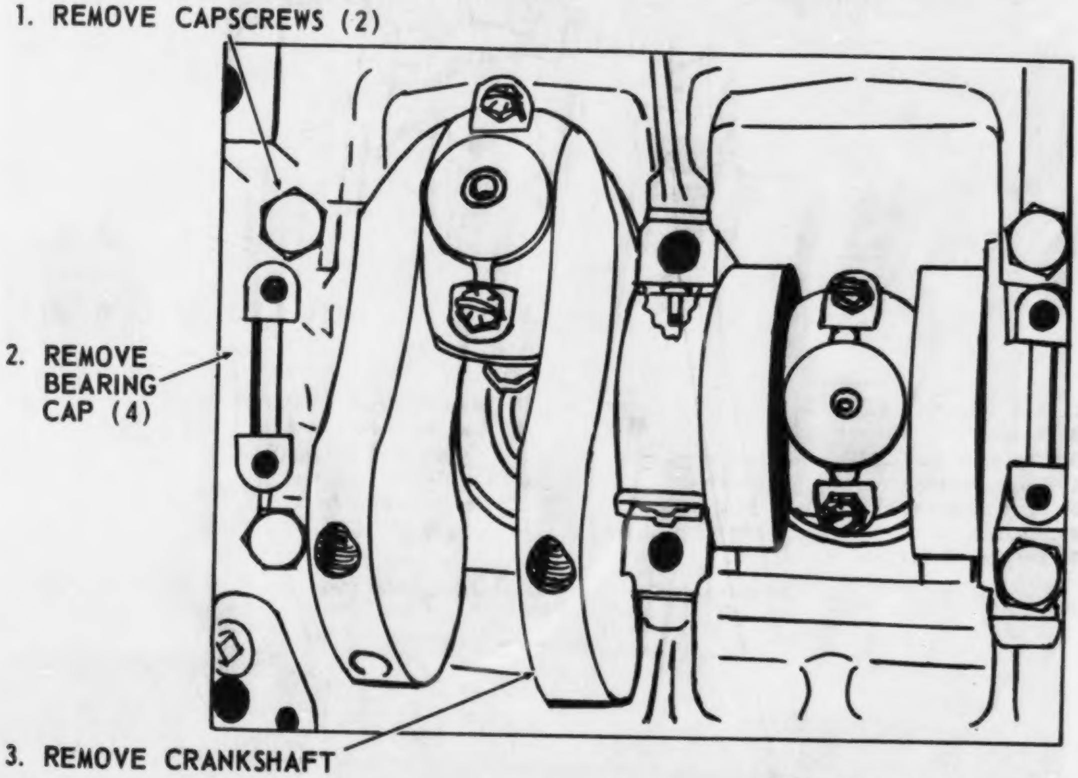

6
7
8
9
16
18
19
17
16
19
15
14
13
12
11
10
22
21
21
20
20
5
4
3
2
1
1

MEC 3810-287-15/ 6-34

Figure 6–34. Piston and connecting rod, exploded view.

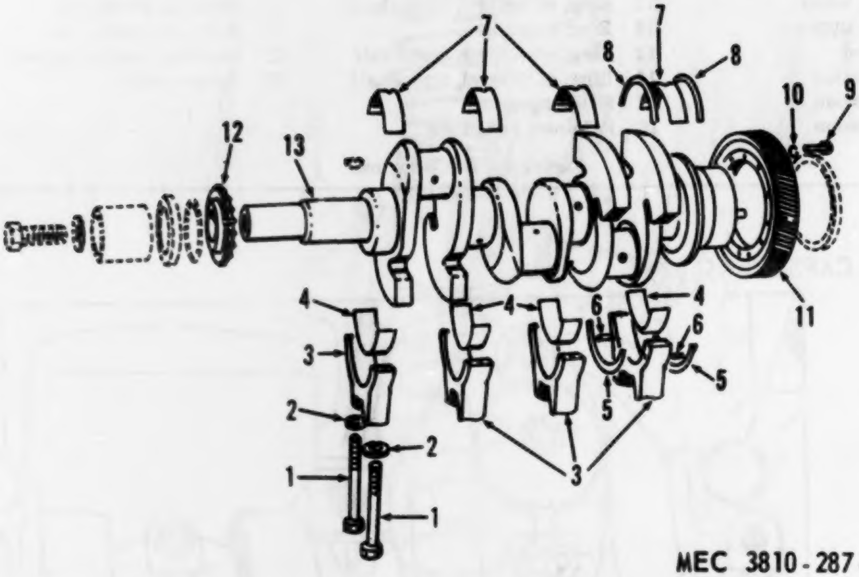
1 Nut, connecting rod (2)
2 Cap, connecting rod bearing
3 Bearing half, lower
4 Bearing half, upper
5 Connecting rod
6 Ring, compression
7 Ring, compression
8 Ring, compression
9 Ring, compression
10 Ring, oil control lower half
11 Ring, oil control, upper half
12 Ring expander
13 Ring, oil control, lower half
14 Ring, oil control, upper half
15 Ring expander
16 Retainer, piston pin
17 Pin, piston
18 Piston
19 Bushing, piston pin
20 Bolt, connecting rod
21 Bushing, connecting rod
22 Spray nozzle

Figure 6-34—Continued.



MEC 3810-287-15/ 6-35

Figure 6-35. Crankshaft assembly, removal and installation.



MEC 3810-287-15/ 6-36

1 Bolt, crankshaft main bearing cap (8)
2 Washer, lock, 5/8 in. (8)
3 Cap, main bearing (4)
4 Bearing shell, lower (4)
5 Washer, thrust, lower (2)
6 Pin, dowel (2)
7 Bearing, shell, upper (4)
8 Washer, thrust, upper (2)
9 Bolt, crankshaft gear (6)
10 Washer, lock, 3/8 in. (6)
11 Crankshaft gear, timing
12 Gear, oil pump drive
13 Crankshaft

Figure 6–36. Crankshaft assembly, exploded view.

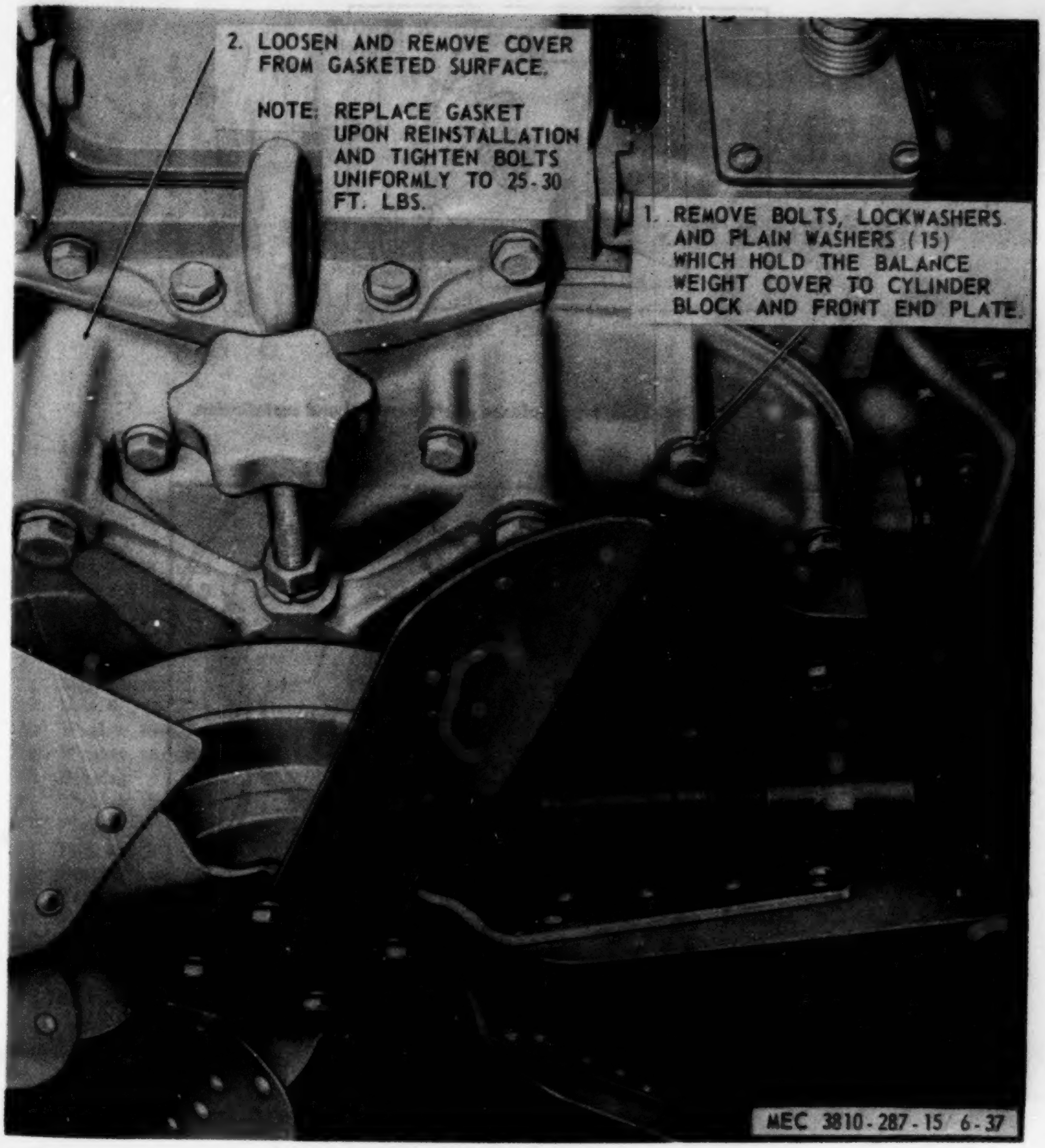

2. LOOSEN AND REMOVE COVER FROM GASKETED SURFACE.
NOTE: REPLACE GASKET UPON REINSTALLATION AND TIGHTEN BOLTS UNIFORMLY TO 25-30 FT. LBS.
1. REMOVE BOLTS, LOCKWASHERS AND PLAIN WASHERS (15) WHICH HOLD THE BALANCE WEIGHT COVER TO CYLINDER BLOCK AND FRONT END PLATE.
MEC 3810-287-15 6-37

Figure 6-37. Balance weight cover, removal and installation.

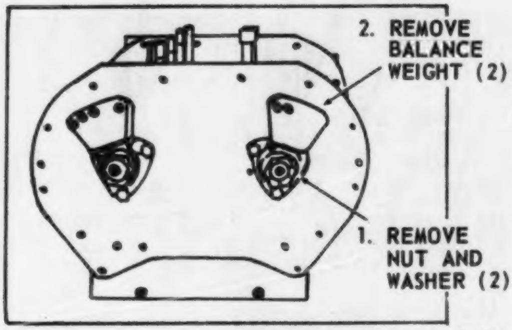

2. REMOVE BALANCE WEIGHT (2)
1. REMOVE NUT AND WASHER (2)
MEC 3810-287-15/6-38(1)

Figure 6-38 (1). Crankshaft and balance shaft, removal and installation.

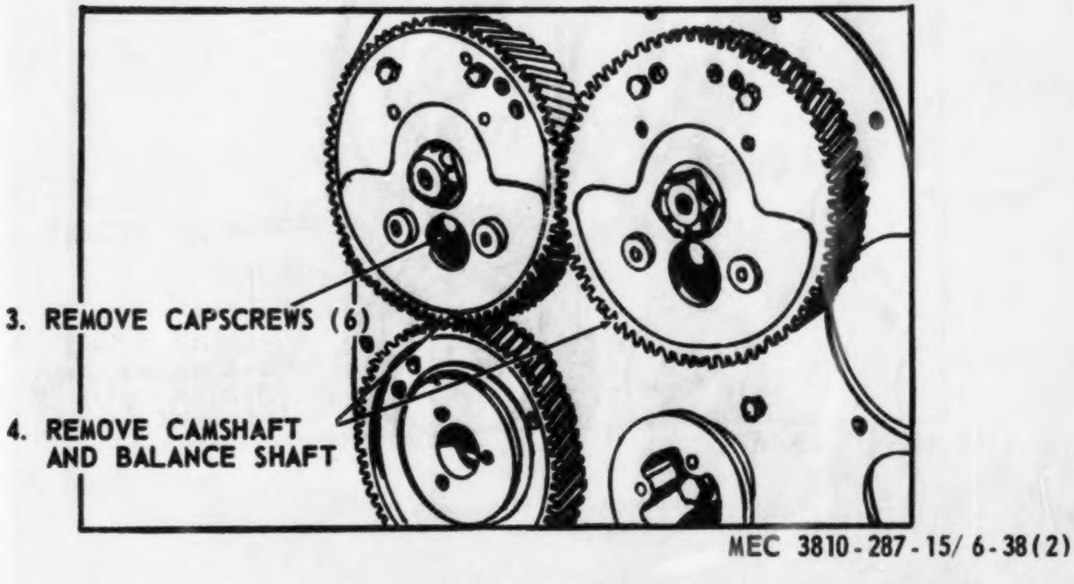
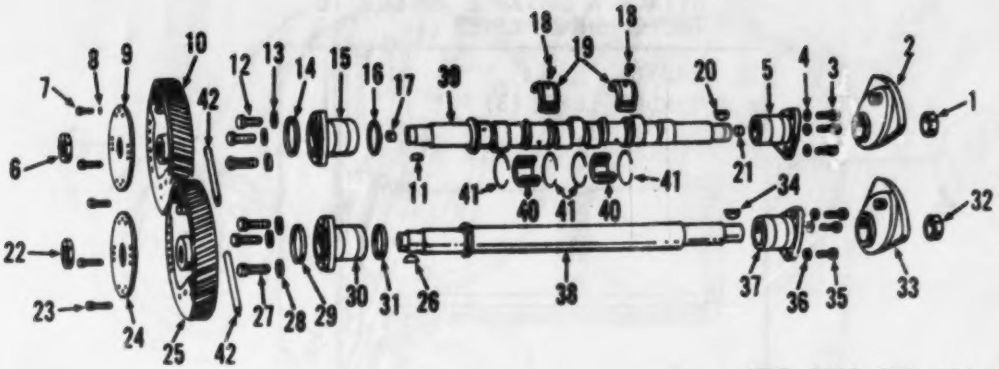

3. REMOVE CAPSCREWS (6)
4. REMOVE CAMSHAFT AND BALANCE SHAFT
MEC 3810-287-15/6-38(2)

Figure 6-38 (2).—Continued.

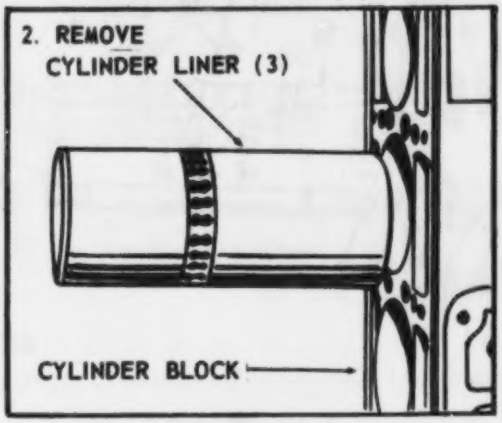

18
18
19
10
8
9
12
13
14
15
16
17
39
20
5
4
3
2
7
42
1
6
11
41
40
41
40
41
21
34
32
22
30
31
26
38
37
36
35
33
23
24
25
42
27
28
29

MEC 3810-287-15/ 6-39

1 Nut, 1 1/8 in.-18
2 Weight
3 Bolt, 3/8 in.-16 x 1 1/4 in. lg. (3)
4 Washer, lock, 3/8 in. (3)
5 Bearing
6 Nut, 1 1/8 in.-18
7 Bolt, 3/8 in.-24 x 1 in. lg. (3)
8 Washer, lock, 3/8 in. (3)
9 Retainer
10 Gear, camshaft timing
11 Key, woodruff, 1/4 x 1 in.
12 Bolt, 3/8 in.-16 x 1 1/4 in. lg. (3)
13 Washer, lock, 3/8 in. (3)
14 Washer, thrust
15 Bearing
16 Washer, thrust
17 Plug
18 Bolt, special (2)
19 Bearing half, intermediate outer (2)
20 Key, woodruff, 1/4 x 1 in.
21 Plug
22 Nut, 1 1/8 in.-18
23 Bolt, 3/8 in.-24 x 1 1/8 in. lg. (3)
24 Retainer
25 Gear, balance shaft timing
26 Key, woodruff, 1/4 x 1 in.
27 Bolt, 3/8 in.-16 x 1 1/4 in. lg. (3)
28 Washer, lock, 3/8 in.
29 Washer, thrust
30 Bearing
31 Washer, thrust
32 Nut, 1 1/8 in.-18
33 Weight
34 Key, woodruff, 1/4 x 1 in.
35 Bolt, 3/8 in.-16 x 1 1/4 in. lg. (3)
36 Washer, lock, 3/8 in. (3)
37 Bearing
38 Balance shaft
39 Camshaft
40 Bearing half, intermediate inner (2)
41 Retainer (4)
42 Weight (2)

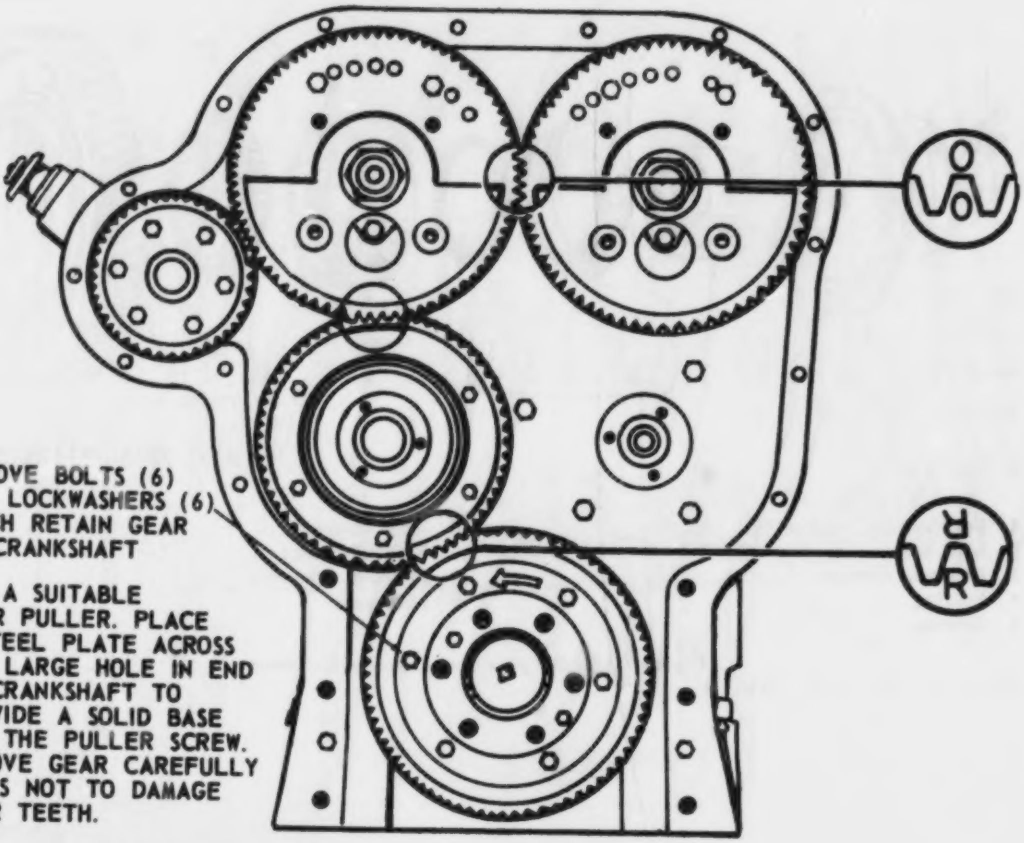
Figure 6-39. Camshaft and balance shaft, exploded view.

1. ATTACH A SUITABLE PULLER TO THE CYLINDER LINER (3)


2. REMOVE
CYLINDER LINER (3)
CYLINDER BLOCK

MEC 3810-287-15/6-40

Figure 6-40. Cylinder liners, removal and installation.



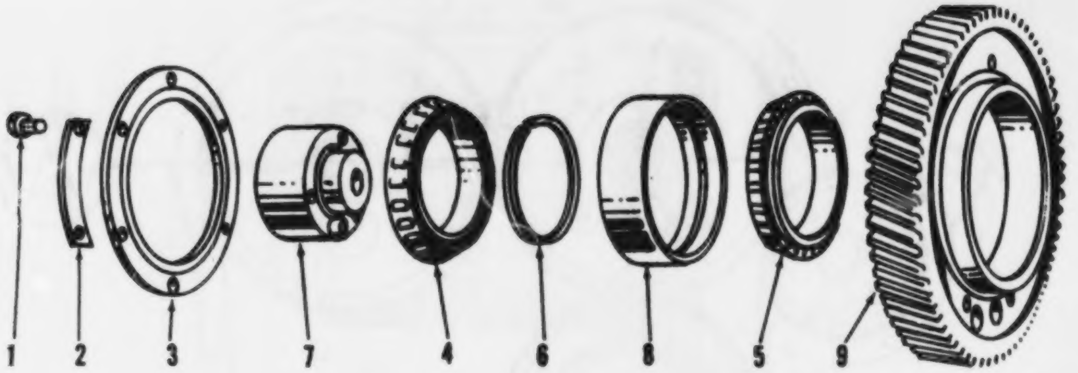
1. REMOVE BOLTS (6) AND LOCKWASHERS (6) WHICH RETAIN GEAR TO CRANKSHAFT

2. USE A SUITABLE GEAR PULLER. PLACE A STEEL PLATE ACROSS THE LARGE HOLE IN END OF CRANKSHAFT TO PROVIDE A SOLID BASE FOR THE PULLER SCREW. REMOVE GEAR CAREFULLY SO AS NOT TO DAMAGE GEAR TEETH.

NOTE: WHEN INSTALLING GEARS ALIGN THE CORRESPONDING "MATCH MARKS" ON MATING GEARS.

MEC 3810-287-15/6-41

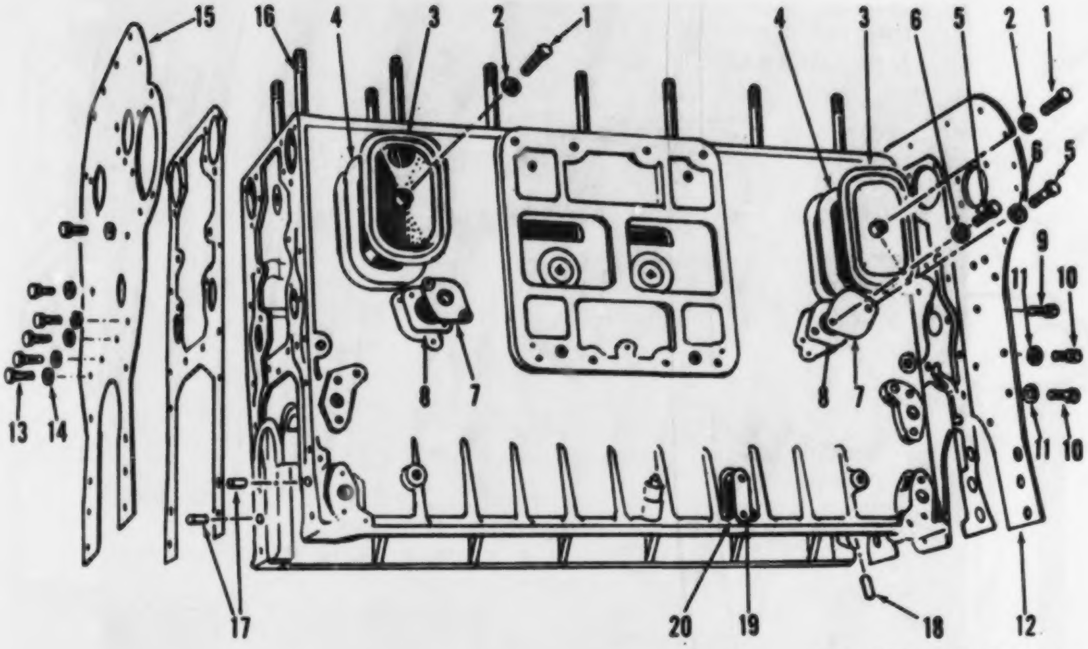
Figure 6-41. Timing gears, removal and installation.



MEC 3810-287-15/ 6-42

1	Bolt, bearing retainer (6)
2	Lock, bearing retainer bolt (3)
3	Retainer, bearing
4	Bearing
5	Bearing
6	Ring spacer
7	Hub, idler gear
8	Bearing outer race
9	Idler gear

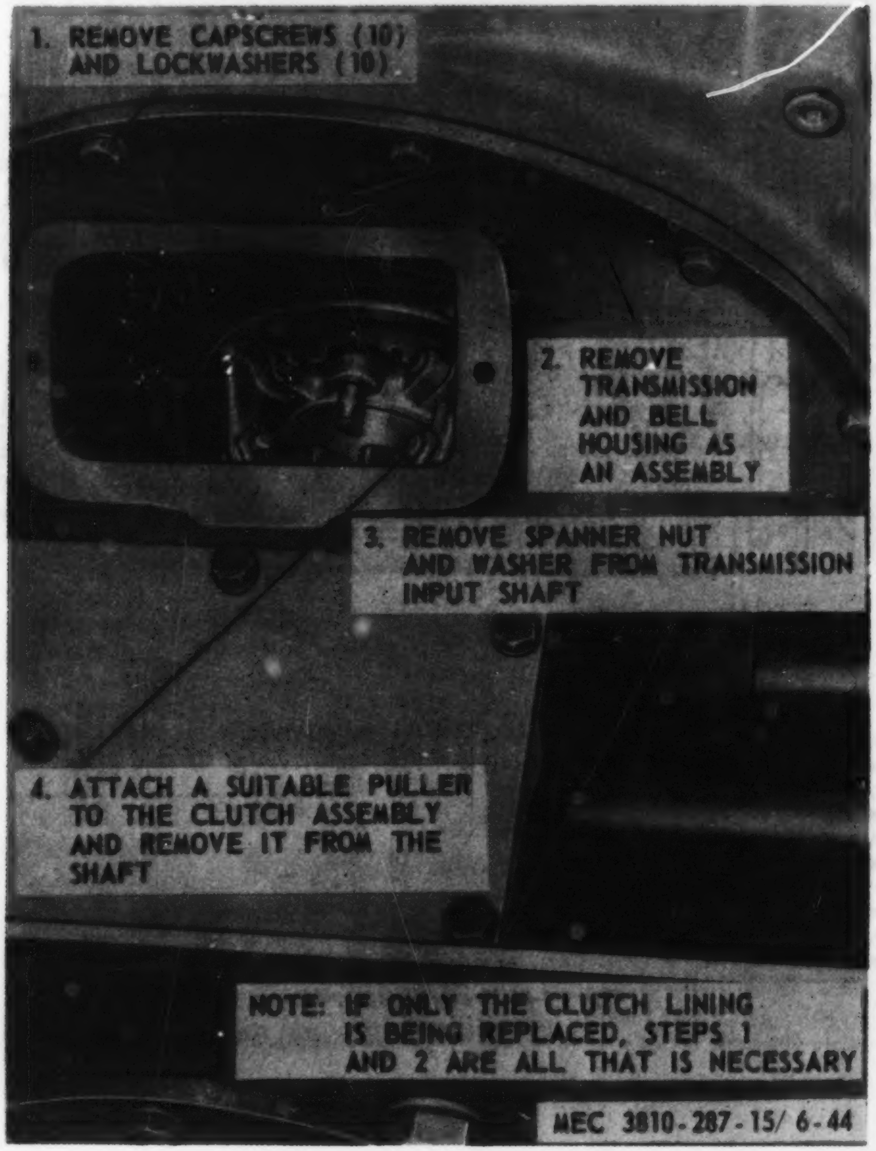
Figure 6–42. Idler gear assembly, exploded view.


15
16
4
3
2
1
4
3
6
5
2
1
6
5
9
11
10
13
14
8
7
8
7
11
10
17
20
19
18
12

MEC 3810-287-15/6-43

1 Screw, cap
2 Washer, lock
3 Cover, hand hole (2)
4 Gasket (2)
5 Screw, cap (4)
6 Washer, lock (4)
7 Cover (2)
8 Gasket (2)
9 Screw, cap
10 Screw, cap
11 Washer, lock
12 Plate
13 Screw, cap
14 Washer, lock
15 Plate
16 Stud
17 Dowel (2)
18 Dowel
19 Cover
20 Gasket

Figure 6-43. Engine block, exploded view.



1. REMOVE CAPSCREWS (10) AND LOCKWASHERS (10)

2. REMOVE TRANSMISSION AND BELL HOUSING AS AN ASSEMBLY

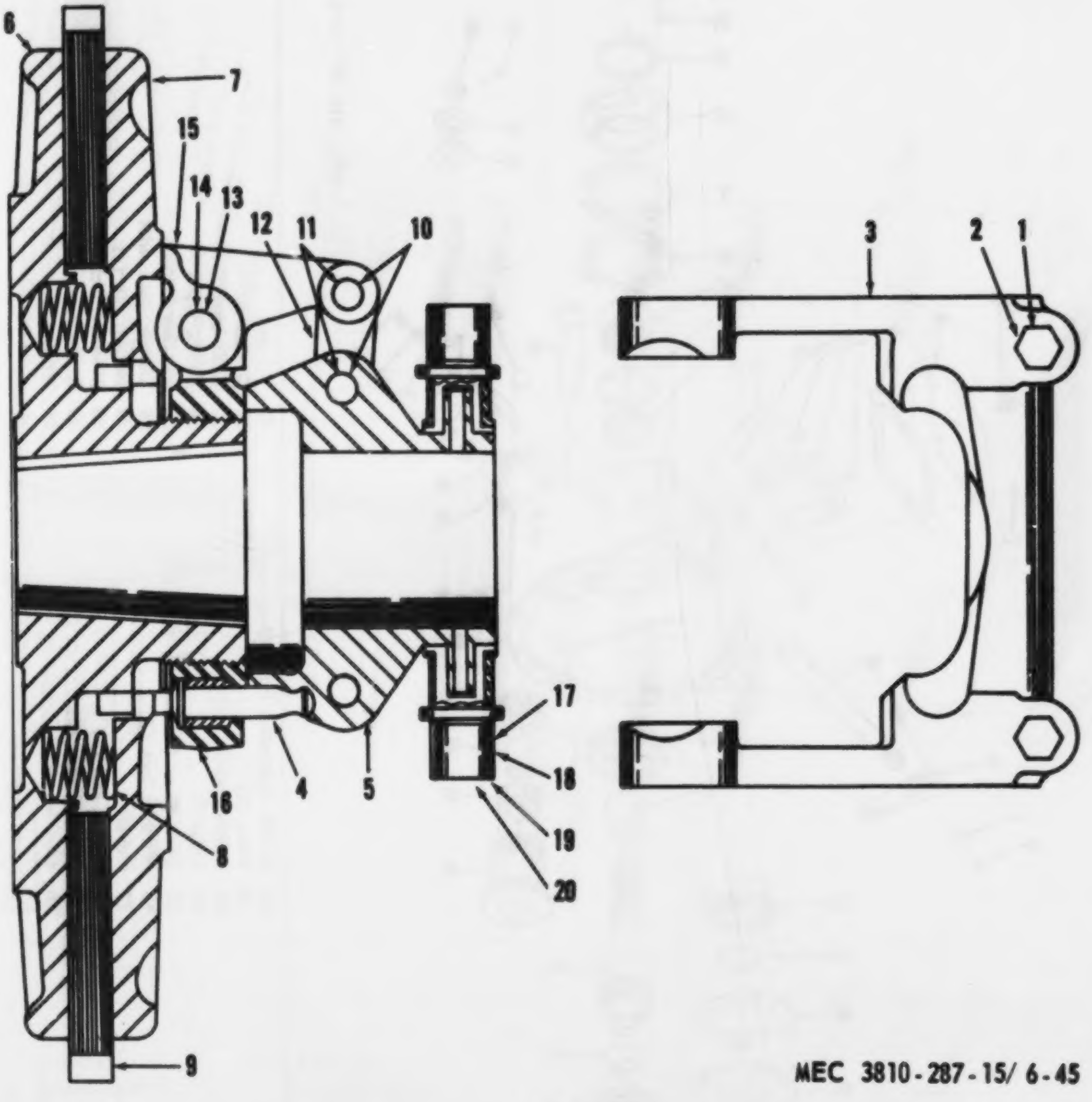
3. REMOVE SPANNER NUT AND WASHER FROM TRANSMISSION INPUT SHAFT

4. ATTACH A SUITABLE PULLER TO THE CLUTCH ASSEMBLY AND REMOVE IT FROM THE SHAFT

NOTE: IF ONLY THE CLUTCH LINING IS BEING REPLACED, STEPS 1 AND 2 ARE ALL THAT IS NECESSARY

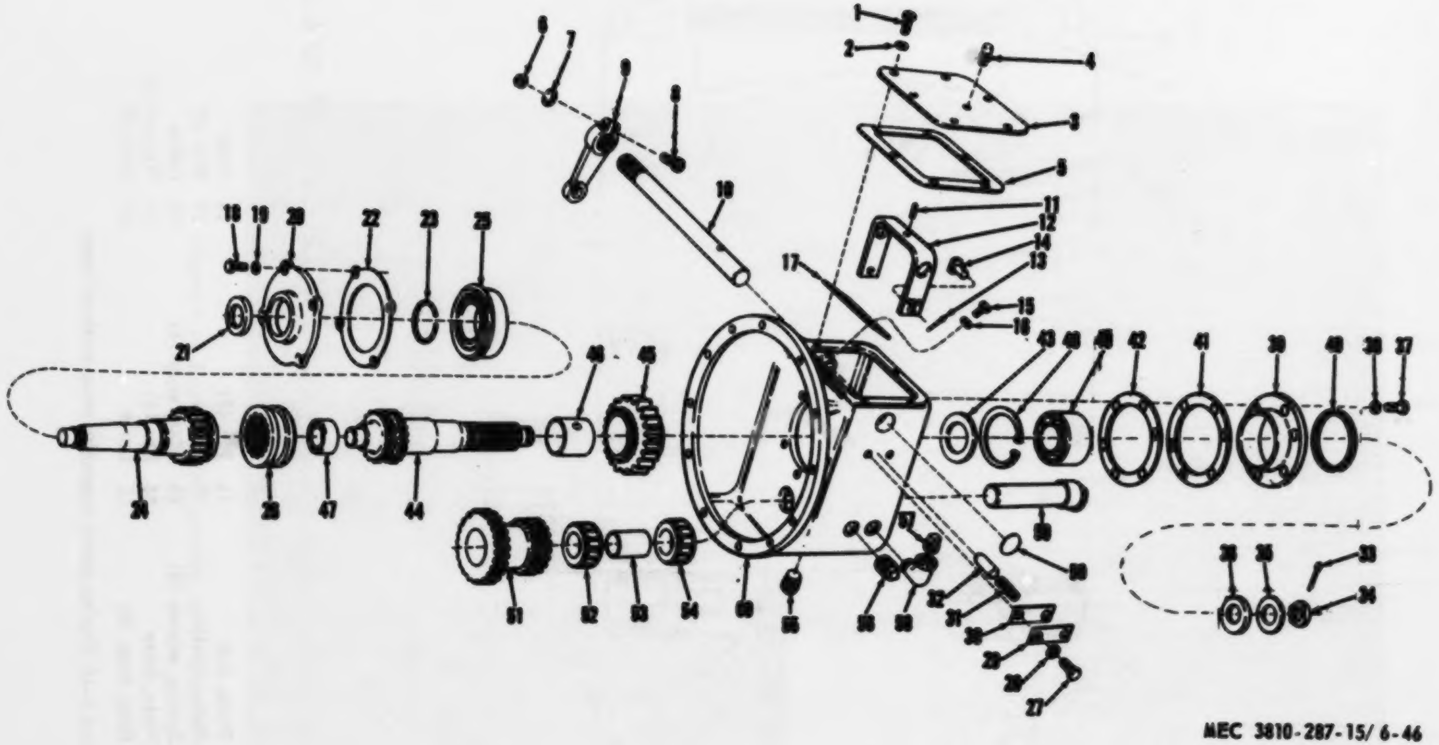
MEC 3810-287-15/ 6-44

Figure 6-44. Engine clutch assembly, removal and installation.


6
7
15
14
13
12
11
10
3
2
1
17
18
16
4
5
19
8
20
9
MEC 3810-287-15/ 6-45

1 Screw (2)
2 Washer, lock (2)
3 Yoke, operating
4 Pin, lock
5 Sleeve, sliding
6 Plate, hub
7 Plate, floating
8 Spring, release (6)
9 Plate, drive
10 Ring, snap (8)
11 Pin (8)
12 Lever
13 Ring, snap (4)
14 Pin (4)
15 Lever
16 Yoke
17 Nut (2)
18 Collar
19 Washer (4)
20 Bolt (2)

Figure 6-45. Engine clutch assembly, cross-sectional view.


1
2
4
3
5
6
7
9
8
10
11
12
14
13
15
16
17
18
19
20
22
23
25
21
24
26
47
44
46
45
43
42
41
39
40
38
37
33
34
27
28
29
30
31
32

MEC 3810-287-15/ 6-46

1 Screw, cap (6)
2 Washer, lock (6)
3 Cover
4 Breather
5 Gasket
6 Nut
7 Washer, lock
8 Screw, cap
9 Lever, shaft
10 Shaft
11 Screw, gear shift forklock
12 Fork (2)
13 Pin, cotter
14 Shoe
15 Screw, cap (2)
16 Washer, lock (2)
17 Cover
18 Screw, cap (5)
19 Washer, lock (5)
20 Cap, bearing
21 Oil seal
22 Gasket
23 Snap ring
24 Shaft, input
25 Bearing
26 Clutch, gear shift
27 Screw, cap (2)
28 Washer, lock (2)
29 Plate
30 Gasket

Figure 6-46. Transmission assembly, exploded view.

31	Spring	41	Shim (3)	51	Gear, cluster
32	Plunger	42	Gasket	52	Bearing
33	Pin, cotter	43	Spacer	53	Spacer
34	Nut	44	Shaft, output	54	Bearing
35	Washer, flat	45	Gear	55	Plug, pipe
36	Spacer	46	Bushing	56	Plug, pipe
37	Screw, cap (6)	47	Bearing	57	Plug, pipe
38	Washer, lock	48	Lockring	58	Ell, street, pipe
39	Cap, bearing	49	Bearing	59	Plug, expansion
40	Oil seal	50	Shaft	60	Case, 2 speed gear

Figure 6–46.—Continued.

CHAPTER 7

SUPERSTRUCTURE REPAIR INSTRUCTIONS

Section I. HOIST SHAFT ASSEMBLY

7–1. General

This section contains repair instructions on the hoist shaft assembly, brakes, and boom hoist ratchet.

7–2. Hoist Shaft Assembly

a. General. The hoist shaft assembly is located near the front of the turntable and mounted on the machinery side frames. The assembly consists of the cable lagging for the main hoist, secondary hoist, and boom hoist. The drums are mounted on antifriction bearings and chain driven from the clutch shaft assembly.

b. Removal.

(1) Remove the hoist and boom hoist cables (para 2–6).

(2) Remove the front cable panels (para 3–83).

(3) Remove the drive chains (para 3–103).

(4) Remove the brake bands (para 3–100).

(5) Refer to paragraph 5–31 and remove the hoist shaft assembly.

c. Disassembly. Disassemble the hoist shaft assembly in the numerical sequence as illustrated on figure 7–1.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective, or damaged parts.

(2) Inspect all bearings for wear and damage. Replace worn or damaged bearings.

(3) Inspect all thrust washers for wear and damage. Replace worn or damaged thrust washers.

(4) Inspect and measure the hoist shaft diameter at all points. Correct dimension is 3.249 to 3.250. Place the shaft in V-blocks or a lathe and check total runout. Total runout should not exceed .004 inch.

f. Reassembly. Reassemble the hoist shaft assembly in reverse of the numerical sequence as illustrated on figure 7–1.

g. Installation.

(1) Refer to paragraph 5–31 and install the hoist shaft assembly.

(2) Install the brake bands (para 3–98).

(3) Install the drive chains (para 3–101).

(4) Install the front cab panels (para 3–81).

(5) Install the hoist and boom hoist cables (para 2–6).

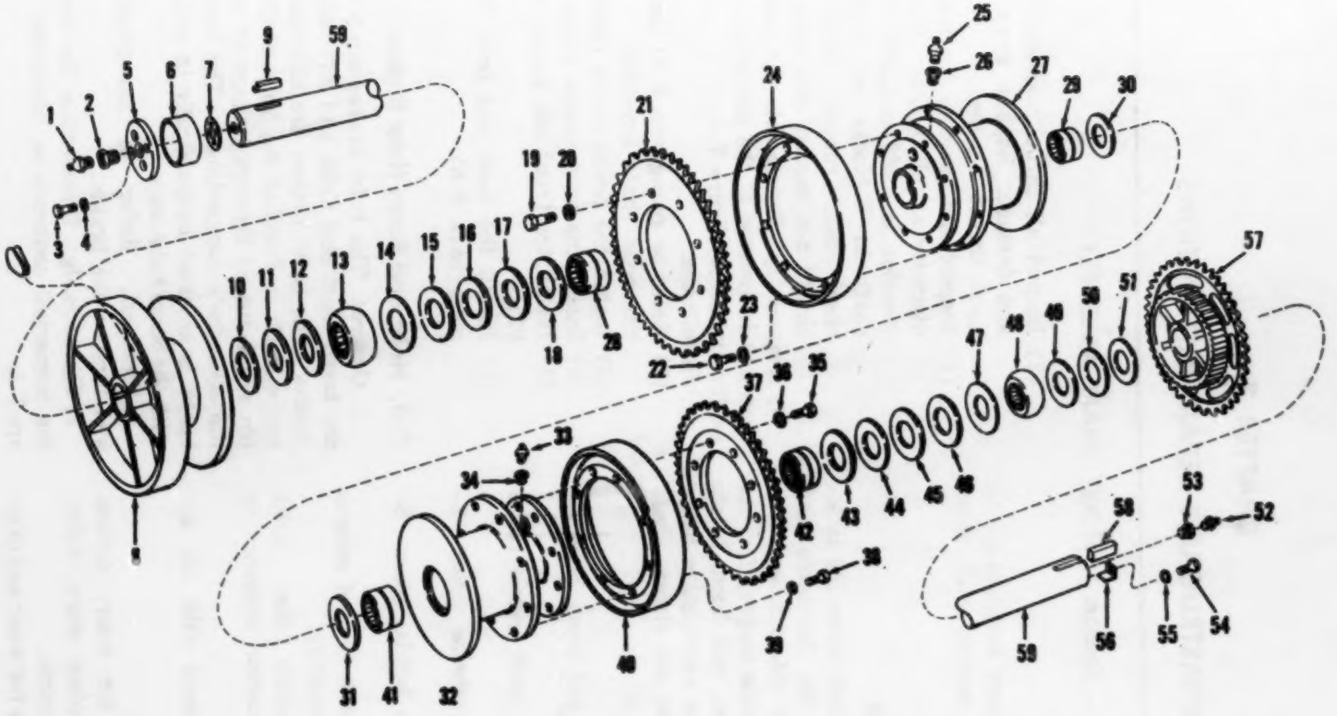
7–3. Hoist and Boom Hoist Brakes

a. General. The hoist brakes are located on the boom hoist and right and left hoist brake drums. The hoist brakes are attached to the brake shaft in front of the hoist shaft assembly and actuated through linkage by pedals in the operator's compartment. The boom hoist brake is actuated hydraulically in conjunction with the boom hoist lever.

b. Removal. Refer to paragraph 3–98 and remove the brakes.

c. Disassembly. Disassemble the brakes in the numerical sequence as illustrated on figure 7–2.

d. Cleaning. Clean all parts with an approved cleaning solution.


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
A. HOIST SHAFT ASSEMBLY
MEC 3810-287-15/7-1

1	Fitting, lubrication
2	Bushing, reducer
3	Screw, cap, 1/2 in. -20 x 1/4 in. (4)
4	Washer, lock, 1/2 in.
5	Plate, end
6	Spacer
7	Shim, laminated, brass
8	Drum, boom hoist
9	Key
10	Washer, thrust, nylon
11	Washer, thrust
12	Washer, thrust, nylon
13	Bearing, self aligning
14	Washer, thrust
15	Washer, thrust
16	Washer, thrust, nylon
17	Washer, thrust
18	Washer, thrust, nylon
19	Screw, cap, 5/8 in. - 11 x 1 1/2 in. (8)
20	Washer, lock, 5/8 in. (8)
21	Sprocket, chain

Figure 7-1. Hoist shaft assembly, exploded view.

22	Screw, cap, 5/8 in. - 11 x 1 1/2 in. (8)
23	Washer, lock, 5/8 in. (8)
24	Drum, brake
25	Fitting, lubrication
26	Bushing, reducer
27	Drum, hoist
28	Bearing
29	Bearing
30	Washer, thrust, nylon
31	Washer, thrust, nylon
32	Drum, hoist
33	Fitting, lubrication
34	Bushing, reducer
35	Screw, cap, 5/8 in. - 11 x 1 1/2 in. (8)
36	Washer, lock, 5/8 in. (8)
37	Sprocket, chain
38	Screw, cap, 5/8 in. (8)
39	Washer, lock, 5/8 in. (8)
40	Drum, brake
41	Bearing
42	Bearing
43	Washer, thrust, nylon
44	Washer, thrust
45	Washer, thrust, nylon
46	Washer, thrust
47	Washer, thrust
48	Bearing
49	Washer, thrust
50	Washer, thrust
51	Washer, thrust nylon
52	Fitting, lubrication
53	Bushing, reducer
54	Screw, cap, 1/2 in. - 20 x 1 1/4 in.
55	Washer, lock, 1/2 in.
56	Lock
57	Sprocket, boom hoist
58	Key
59	Shaft

Figure 7-1—Continued.

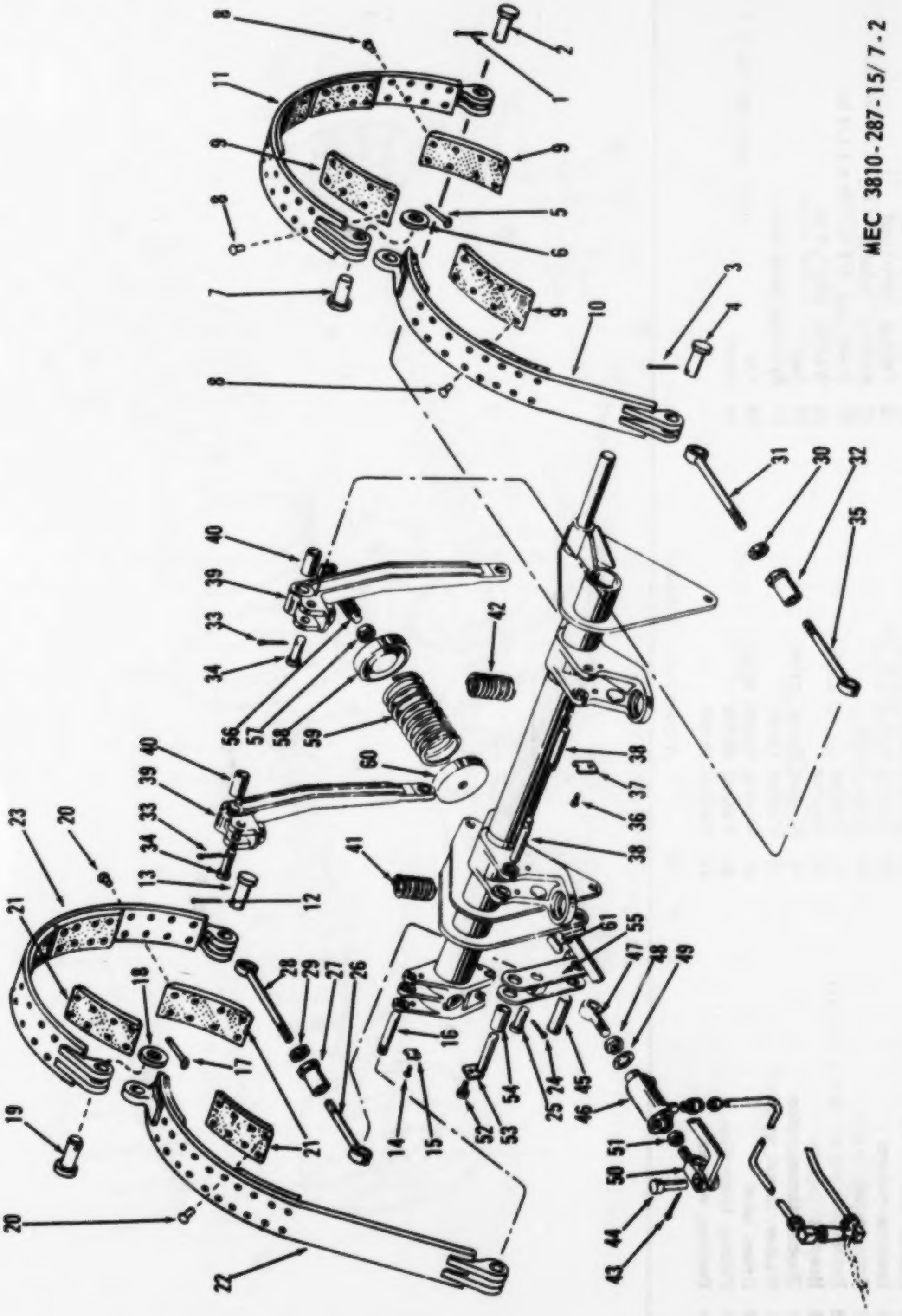

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
MEC 3810-287-15/ 7-2

Figure 7-8. Boom hoist and hoist brakes, exploded view.

1	Pin, cotter	22	Band half, front	43	Pin, cotter
2	Pin	23	Band half, rear	44	Pin
3	Pin, cotter	24	Pin, cotter	45	Pin
4	Pin	25	Pin	46	Cylinder
5	Pin, cotter	26	Bolt, eye	47	Bolt, eye
6	Washer, flat	27	Nut, adjusting	48	Nut, lock
7	Pin	28	Bolt, eye	49	Washer, flat
8	Rivet	29	Nut, lock	50	Bolt, eye
9	Lining segment	30	Nut, lock	51	Nut, lock
10	Band half, front	31	Bolt, eye	52	Screw, cap
11	Band half, rear	32	Nut, adjusting	53	Pin, special
12	Pin, cotter	33	Pin, cotter	54	Bushing
13	Pin	34	Pin	55	Lever
14	Screw, cap	35	Bolt, eye	56	Bolt, special
15	Plate, keeper	36	Screw, cap	57	Nut, lock
16	Pin	37	Plate, keeper	58	Cup, spring
17	Pin, cotter	38	Pin	59	Spring
18	Washer, flat	39	Lever, brake	60	Cup, spring
19	Pin	40	Bushing	61	Stud
20	Rivet	41	Spring		
21	Lining segment	42	Spring		

Figure 7-2.—Continued.

e. Inspection and Repair.

(1) Inspect all parts for wear, defects, and damage. Replace worn, defective, or damaged parts.

(2) Inspect the lining for wear, damage and grease and oil saturation. Replace worn, damaged or saturated lining.

f. Reassembly. Reassemble the brakes in reverse of the numerical sequence as illustrated on figure 7-2.

g. Installation. Refer to paragraph 3-98 and install the brakes.

h. Adjustment. Refer to paragraph 3-15 and adjust the brakes.

Section II. POWER BOOM LOWERING ASSEMBLY

7-4. General

The power boom lowering assembly provides a method of controlling the boom lowering speed through an additional clutch assembly. By engaging the boom lowering clutch, the boom mechanism is geared to the machinery and controlled by engine rpm.

7-5. Power Boom Lowering Assembly

a. General. The power boom lowering assembly is located on the left side of the turntable bed and attached to the clutch shaft housing and bevel gear housing. It is gear and chain driven from the clutch shaft and operates independently of other functions.

b. Removal. Refer to paragraph 5-27 and remove the power boom lowering assembly.

c. Disassembly. Disassemble the power boom lowering assembly in the numerical sequence as illustrated on figure 7-3.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair.

(1) Inspect all parts for wear, defects, and damage. Replace worn, defective, or damaged parts.

(2) Inspect the drum for excessive wear and scoring. Replace a badly worn or scored drum.

(3) Inspect the lining for wear and grease or oil saturation. Replace worn or badly saturated lining.

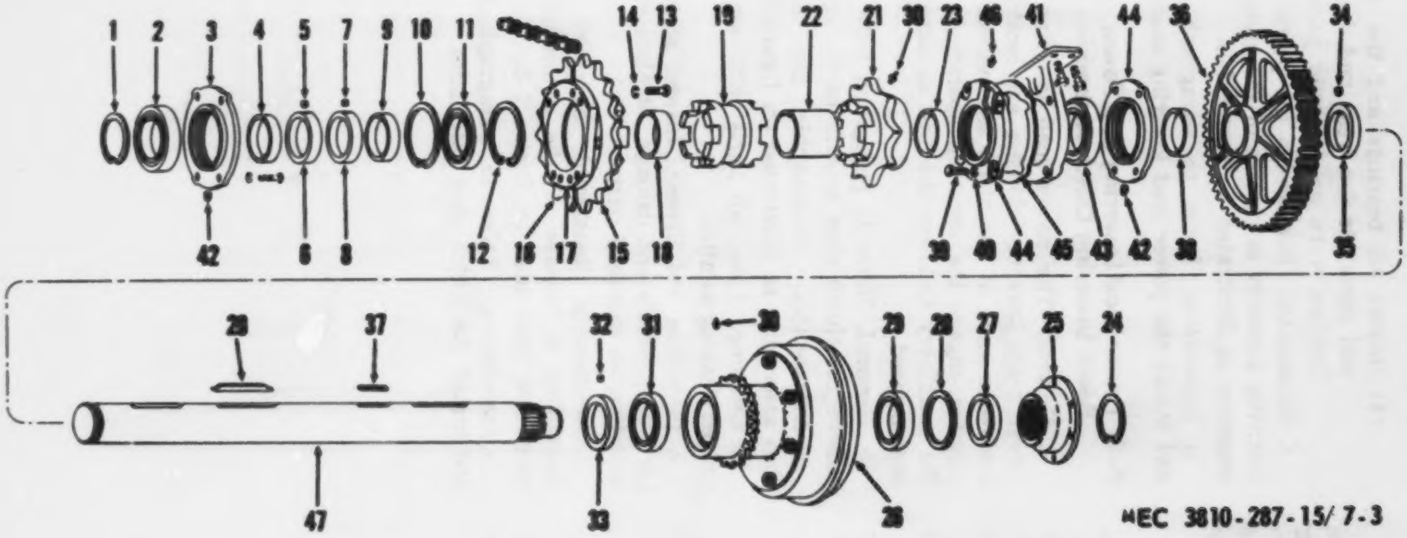
(4) Inspect all bearings and the shaft and sprockets for wear and damage. Replace worn or damaged parts.

f. Reassembly. Reassemble the power boom lowering assembly in reverse of the numerical sequence as illustrated on figure 7-3.

g. Installation.

(1) Refer to paragraph 5-27 and install the power boom lowering assembly.

(2) Refer to paragraph 3-14 and adjust the power boom lowering clutch.


1
2
3
4
5
7
9
10
11
14
13
19
22
21
30
23
46
41
44
36
34
42
6
8
12
16
17
15
18
39
40
44
45
43
42
38
35
20
37
32
31
30
29
28
27
25
24
47
33
26
MEC 3810-287-15/7-3

1	Ring, retainer
2	Bearing
3	Closure, bearing
4	Spacer, bearing
5	Screw, set
6	Collar
7	Screw, set
8	Collar
9	Spacer
10	Ring, retainer
11	Bearing
12	Ring, retainer
13	Screw, cap
14	Washer, lock
15	Sprocket, half
16	Sprocket, half
17	Hub, sprocket
18	Spacer
19	Jaw clutch
20	Key
21	Sprocket
22	Bushing
23	Spacer
24	Ring, retainer
25	Hub
26	Clutch drum
27	Spacer
28	Seal
29	Bearing
30	Fitting, lubrication
31	Bearing
32	Screw, set
33	Collar
34	Screw, set
35	Collar
36	Gear
37	Key
38	Collar
39	Screw, cap
40	Washer, lock
41	Closure, bearing
42	Plug, pipe
43	Bearing
44	Cap, bearing closure
45	Gasket

Figure 7-3. Power boom lowering assembly, exploded view.

Section III. POWER LOAD LOWERING ASSEMBLY

7-6. General

The power load lowering assembly provides a method of controlling the load lowering speed through an additional clutch. By engaging the power load lowering clutch, the load can be lowered at engine speed for precise control.

7-7. Power Load Lowering Assembly

a. General. The power load lowering assembly is located on the right side of the turntable bed and mounted to the right hand floor plate. It is gear driven from the clutch shaft assembly and is independent of all other functions.

b. Removal. Refer to paragraph 5-28 and remove the power load lowering assembly.

c. Disassembly. Disassemble the power load lowering assembly in the numerical sequence as illustrated on figure 7-4.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair.

(1) Inspect all parts for wear, defects, and damage. Replace worn, defective or damaged parts.

(2) Inspect the drum for excessive wear and scoring. Replace a badly worn or scored drum.

(3) Inspect the lining for wear and grease or oil saturation. Replace worn or saturated lining.

(4) Inspect all bearings and the shaft and sprockets for wear and damage. Replace worn or damaged parts.

f. Reassembly. Reassemble the power load lowering assembly in reverse of the numerical sequence as illustrated on figure 7-4.

g. Installation. Refer to paragraph 5-28 and install the power load lowering assembly.

7-8. Power Load Lowering and Power Boom Lowering Clutch Assemblies

a. General. The power load lowering and power boom lowering clutches are located on the outer ends of the shaft assemblies. The clutches engage the lowering operation with the machinery to lower the load at controlled engine speed.

b. Removal. Refer to paragraph 3-99 and remove the clutch shoe assemblies.

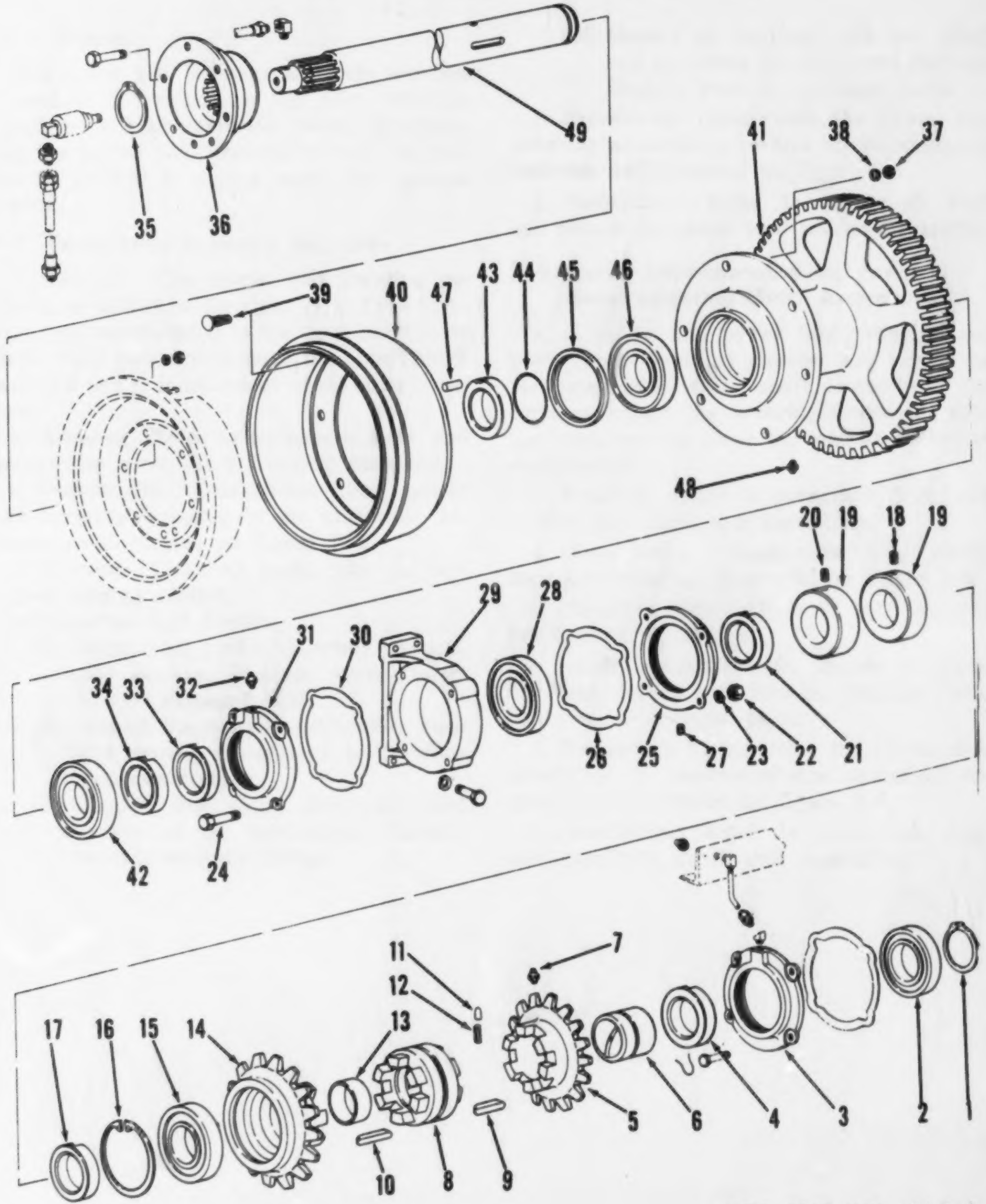
c. Disassembly. Disassemble the clutch shoe assemblies as illustrated on figure 7-5.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective, or damaged parts.

f. Reassembly. Reassemble the clutch shoe assemblies in reverse of the numerical sequence as illustrated on figure 7-5.

g. Installation. Refer to paragraph 3-99 and install the clutch shoe assemblies.

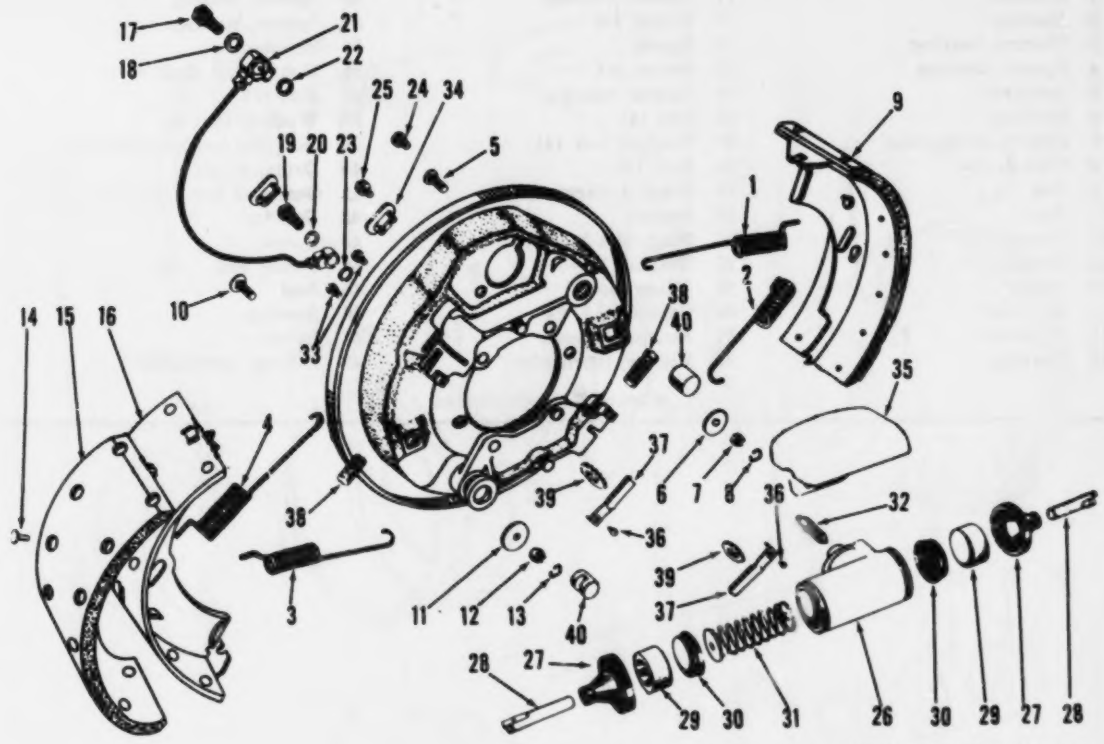

49
41
38
37
35
36
39
40
47
43
44
45
46
48
20
19
18
19
29
28
31
30
32
34
33
26
25
27
23
22
21
42
24
11
7
12
13
17
16
15
14
5
6
4
3
2
1
10
8
9

MEC 3810-287-15/7-4

Figure 7-4. Power load lowering assembly, exploded view.

1 Retainer
2 Bearing
3 Closure, bearing
4 Spacer, bearing
5 Sprocket
6 Bushing
7 Fitting, lubrication
8 Clutch, jaw
9 Key
10 Key
11 Plunger
12 Spring
13 Spacer
14 Sprocket
15 Retainer
16 Bearing
17 Spacer, bearing
18 Screw, set
19 Spacer
20 Screw, set
21 Spacer, bearing
22 Nut (4)
23 Washer, lock (4)
24 Bolt (4)
25 Bearing closure
26 Gasket
27 Plug, pipe 1/4 inch
28 Bearing
29 Pillow block
30 Gasket
31 Bearing closure
32 Fitting, lubrication
33 Spacer, bearing
34 Spacer, bearing
35 Retainer
36 Hub, clutch drum
37 Nut (6)
38 Washer, lock (6)
39 Bolt, flat head, special (6)
40 Drum, clutch
41 Gear and hub assembly
42 Bearing
43 Spacer
44 O-ring seal
45 Seal
46 Bearing
47 Dowel
48 Fitting, lubrication

Figure 7-4.—Continued.



MEC 3810-287-15/7-5

1	Spring, retract
2	Spring, retract
3	Spring, retract
4	Spring, retract
5	Bolt, shoe guide
6	Washer, plain
7	Nut
8	Washer, "C"
9	Assembly, shoe
10	Bolt, shoe guide
11	Washer, plain
12	Nut
13	Washer, "C"
14	Rivet, lining (28)
15	Lining, clutch (2)
16	Shoe, clutch
17	Bolt, connection
18	Gasket
19	Bolt, connection
20	Gasket
21	Fitting
22	Gasket
23	Gasket
24	Screw, cap
25	Screw, cap
26	Casting, cylinder (2)
27	Boot (2)
28	Rod, push (2)
29	Piston (2)
30	Cup, piston (2)
31	Assembly, spring (2)
32	Screw, bleeder (2)
33	Screw, cap (2)
34	Cover, slot (2)
35	Cover, cylinder (2)
36	Screw (2)
37	Spring, adjusting lock (2)
38	Screw, adjusting (2)
39	Wheel, adjusting (2)
40	Pin, anchor (2)

Figure 7-5. Power load lowering and power boom lowering clutch assemblies.

Section IV. CLUTCH SHAFT ASSEMBLY

7-9. General

This section contains repair instructions on the clutch shaft assembly. Since the clutch shaft assembly is in two parts joined by a splined coupling, they are designated left hand and right hand, and covered in separate paragraphs.

7-10. Clutch Shaft Assembly (left hand)

a. General. The left hand clutch shaft assembly is located near the rear of, and attached to the left machinery side frame. It is chain driven from the engine output shaft, and transmits power to the swing, hoist, power load and boom lowering, and the third drum assembly.

b. Removal.

(1) Refer to paragraph 3-96 and remove the clutch shifter fork assemblies.

(2) Refer to paragraph 5-32 and remove the left hand clutch shaft assembly.

c. Disassembly. Disassemble the left hand clutch shaft assembly in the numerical sequence as illustrated on figure 7-6.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair.

(1) Inspect all parts for wear, defects, and damage. Replace worn, defective, or damaged parts.

(2) Inspect all bearings for wear and damage. Replace worn or damaged bearings.

(3) Inspect the clutch drums, lining, linkage, and related parts for wear and damage. Replace worn or damaged parts.

(4) Inspect and measure the shaft for wear, runout, and damage. Total runout must not exceed .003 inch. Correct journal dimensions from left to right are as follows:

No. 1—2.459 to 2.469 inches
No. 2—2.5592 to 2.5596 inches
No. 3—2.720 to 2.750 inches
No. 4—2.6257 to 2.6262 inches
No. 5—2.5589 to 2.5593 inches
No. 6—2.5007 to 2.5012 inches
No. 7—2.4364 to 2.4375 inches

Replace a worn or damaged shaft.

(5) Inspect the splines for wear and damage. Replace a shaft with badly worn or damaged splines.

(6) Inspect the drum inner bore for indications of the bearing race having turned. Replace the drum if the bearing race does not fit securely.

f. Reassembly. Reassemble the left hand clutch shaft assembly in reverse of the numerical sequence as illustrated on figure 7-6.

g. Installation. Refer to paragraph 5-32 and install the left hand clutch shaft assembly.

h. Adjustment. Refer to paragraph 3-13 and adjust the clutch shoe assemblies.

7-11. Clutch Shaft Assembly (right hand)

a. General. The right hand clutch shaft assembly is located near the rear of, and attached to the right hand machinery frame. The engine drive sprocket is mounted on the right end and receives power from the engine drive sprocket.

b. Removal. Refer to paragraph 5-32 and remove the right hand clutch shaft assembly.

c. Disassembly. Disassemble the right hand clutch shaft assembly in the numerical sequence as illustrated on figure 7-7.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair.

(1) Inspect all parts for wear, defects, and damage. Replace worn, defective or damaged parts.

(2) Inspect all bearings for wear and damage. Replace worn or damaged bearings.

(3) Inspect the clutch drums, lining, linkage, and related parts for wear and damage. Replace worn or damaged parts.

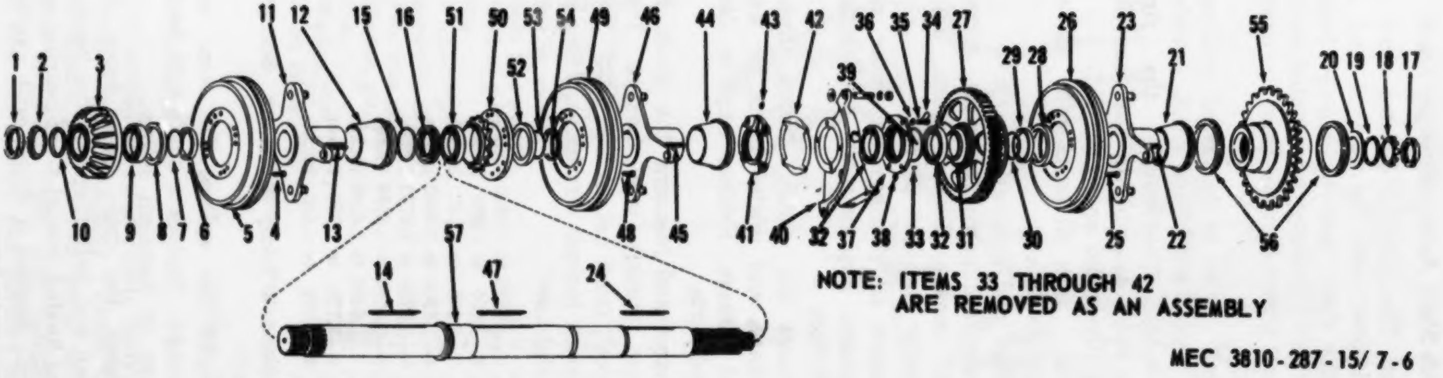
(4) Inspect and measure the shaft for wear, runout, and damage. Total runout must not exceed .003 inch. Correct journal dimensions from left to right are:

No. 1—1.7578 to 1.7660 inches
No. 2—1.680 to 1.690 inches
No. 3—2.246 to 2.247 inches
No. 4—2.3508 to 2.3590 inches
No. 5—2.3739 to 2.3750 inches
No. 6—2.5589 to 2.5593 inches
No. 7—2.6257 to 2.6262 inches
No. 8—2.720 to 2.750 inches
No. 9—2.459 to 2.469 inches

Replace a badly worn or damaged shaft.

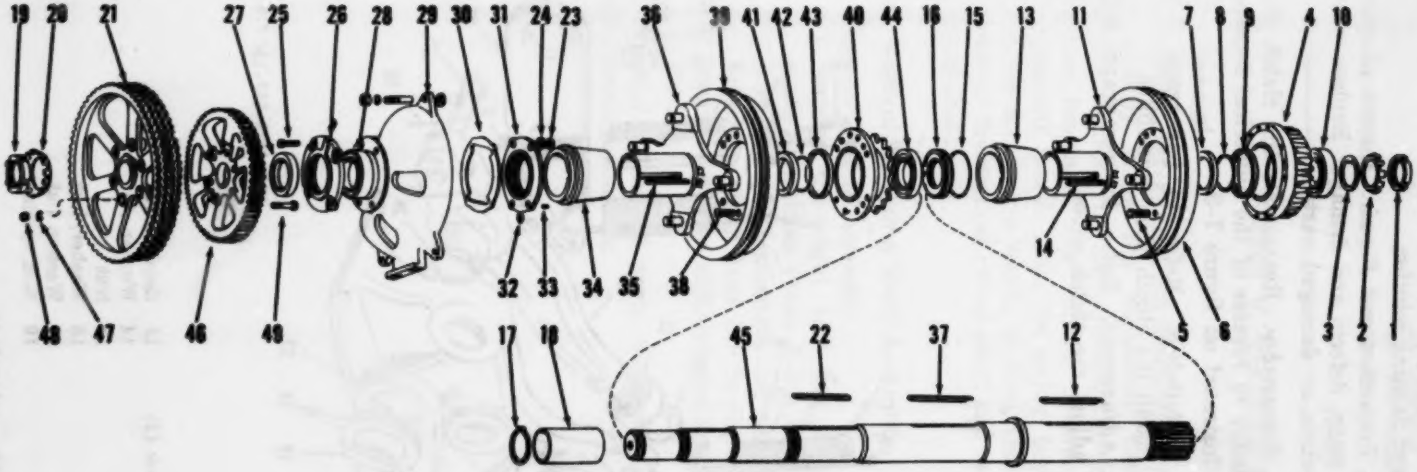
(5) Inspect the splines for wear and damage. Replace a shaft with badly worn or damaged splines.

(6) Inspect the drum inner bores for wear and indications of the bearing race having turned from bearing seizure. Replace a drum with scored inner race bores.


1
2
3
10
9
8
7
6
5
4
11
12
13
15
16
51
50
53
52
54
49
46
48
45
44
43
42
41
40
39
32
37
38
36
35
34
27
33
32
31
29
28
30
26
23
25
21
22
55
56
20
19
18
17
14
57
47
24
NOTE: ITEMS 33 THROUGH 42
ARE REMOVED AS AN ASSEMBLY
MEC 3810-287-15/ 7-6

1	Nut	19	Spacer	37	Bearing closure (outer half)
2	Washer, retaining	20	Spacer	38	Fitting, lubrication
3	Bevel gear	21	Cone, clutch	39	Bearing
4	Screw, cap	22	Key	40	Stand
5	Drum, clutch	23	Spider	41	Bearing closure (inner half)
6	Seal	24	Key	42	Spacer
7	O-ring	25	Bolt	43	Fitting, lubrication
8	O-ring spacer	26	Drum, clutch	44	Cone, clutch
9	Bearing	27	Gear	45	Key
10	Seal	28	Seal	46	Spider
11	Spider	29	O-ring spacer	47	Key, special
12	Cone, clutch	30	O-ring	48	Screw, cap
13	Key	31	Seal	49	Drum, clutch
14	Key	32	Bearing	50	Sprocket
15	O-ring	33	Dowel	51	Bearing
16	Bearing	34	Lockwire	52	Seal
17	Nut	35	Bolt	53	O-ring
18	Washer, retaining	36	Washer, lock	54	O-ring spacer

Figure 7-6. Left hand clutch shaft assembly, exploded view.


19
20
21
27
25
26
28
29
30
31
24
23
36
39
41
42
43
40
44
16
15
13
11
7
8
9
4
10
48
47
46
49
32
33
34
35
38
14
5
6
3
2
1
17
18
45
22
37
12

MEC 3810-287-15/ 7-7

1 Nut
2 Washer, lock
3 Retaining ring
4 Bevel gear
5 Screw, cap
6 Drum, clutch
7 Seal
8 O-ring
9 O-ring
10 Bearing
11 Spider, clutch
12 Key, special
13 Cone, clutch
14 Key
15 O-ring
16 Bearing
17 Snap ring
18 Spacer
19 Nut
20 Washer, lock
21 Sprocket
22 Key
23 Nut
24 Washer, lock
25 Bolt
26 Bearing closure (outside half)
27 Seal
28 Bearing
29 Stand, mounting
30 Spacer
31 Bearing closure (inside half)
32 Fitting, lubrication
33 Dowel
34 Cone, clutch
35 Key
36 Spider
37 Key, special
38 Screw, cap
39 Drum, clutch
40 Sprocket
41 Seal
42 O-ring
43 O-ring spacer
44 Bearing

Figure 7-7. Right hand clutch assembly, exploded view.

7-12. Clutch Shaft Clutch Shoe Assemblies

a. General. The clutch shaft assembly contains five identical clutches which control the various operations of the machine. Two swing clutches, a left hand hoist clutch, right hand hoist clutch and the boom hoist clutch.

b. Removal. Refer to paragraph 3-98 and remove the clutch shoe assemblies.

c. Disassembly. Disassemble the clutch shoe assemblies in the numerical sequence as illustrated on figure 7-8.

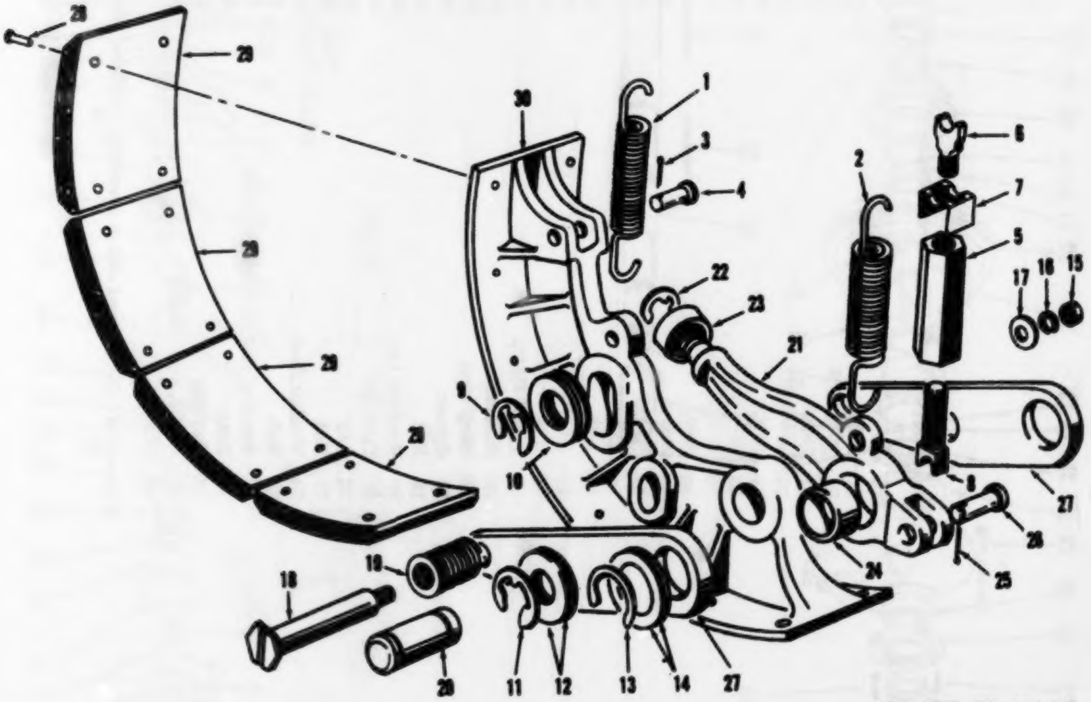
d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective, or damaged parts.

f. Reassembly. Reassemble the clutch shoe assembly in reverse of the numerical sequence as illustrated on figure 7-8.

g. Installation. Refer to paragraph 3-98 and install the clutch shoe assemblies.

h. Adjustment. Refer to paragraph 3-13 and adjust the clutch shoes.



MEC 3810-287-15/7-8

1	Spring, return
2	Spring, return
3	Pin, cotter
4	Pin
5	Nut, adjustment (2)
6	Screw, special (2)
7	Spring, adjustment lock (2)
8	Screw, special (2)
9	Retainer (2)
10	Washer (2)
11	Retainer (2)
12	Washer (2)
13	Retainer (2)
14	Washer (2)
15	Nut
16	Washer, lock
17	Washer, flat
18	Bolt, special

Figure 7-8. Clutch shoe assembly, exploded view.

19 Spring
20 Pin
21 Lever
22 Retainer
23 Bearing
24 Bushing
25 Pin, cotter
26 Pin
27 Tie-bar (2)
28 Rivet (32)
29 Lining (8)
30 Shoe (2)

Figure 7-8.—Continued.

Section V. VERTICAL REVERSING SHAFT ASSEMBLY

7-13. General

The vertical reversing shaft assembly is located directly below the horizontal bevel gears, and mounted in the turntable bed on antifriction bearings. The vertical reversing shaft transmits power from the swing bevel gears to the deck gears which, in turn, transmit power to the vertical swing shaft and vertical travel shaft.

7-14. Vertical Reversing Shaft Assembly

a. Removal and Disassembly.

(1) Remove the right and left clutch shaft assemblies (para 5-32).

(2) Remove and disassemble the vertical reversing shaft assembly in the numercial sequence as illustrated on figure 7-9.

b. Cleaning. Clean all parts with an approved cleaning solution.

c. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

(2) Inspect bearings for wear and damage. Replace worn or damaged bearings.

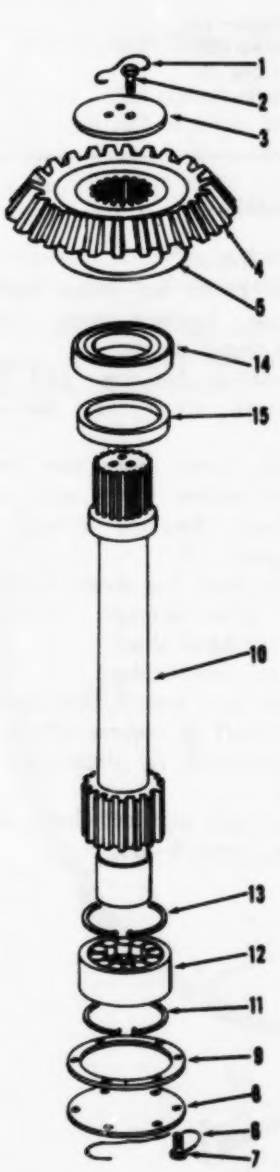
(3) Inspect the bevel gear for wear, cracked or broken teeth and damaged splines. Replace a worn or damaged gear.

(4) Inspect the shaft for wear, damaged splines or other damage. Replace a worn or damaged shaft.

d. Reassembly and Installation.

(1) Reassemble and install the vertical reversing shaft in reverse of the numerical sequence as illustrated on figure 7-9.

(2) Install the right and left clutch shaft assemblies (para 5-32).



MEC 3810-287-15/7-9

Figure 7–9. Vertical reversing shaft, exploded view.

1	Lockwire
2	Screw, cap
3	Plate, retainer
4	Bevel gear
5	Washer, thrust
6	Lockwire
7	Screw, cap
8	Plate
9	Gasket
10	Shaft, reversing
11	Snapring
12	Bearing, lower
13	Snapring
14	Bearing, upper
15	Seal

Figure 7–9.—Continued.

Section VI. BEVEL GEAR HOUSING

7–15. General

The bevel gear housing is located between the right and left clutch shaft assemblies and mounted on the turntable bed. It encloses the swing gears and is pressure lubricated from the hydraulic system.

7-16. Bevel Gear Housing

a. Removal.

(1) Remove the right and left clutch shaft assemblies (para 5-32).

(2) Refer to figure 7-10 and remove the bevel gear housing.

b. Disassembly. Disassemble the bevel gear housing in the numerical sequence as illustrated on figure 7-11.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective, or damaged parts.

(2) Inspect the housing for cracks and damage. Repair or replace a cracked or damaged housing.

(3) Inspect the bearings and bearing assembly for wear and damage. Replace worn or damaged parts.

e. Reassembly. Reassemble the bevel gear housing in reverse of the numerical sequence as illustrated on figure 7-11.

f. Installation.

(1) Refer to figure 7-11 and install the bevel gear housing.

(2) Install the right and left clutch shaft assemblies, (para 5-29).

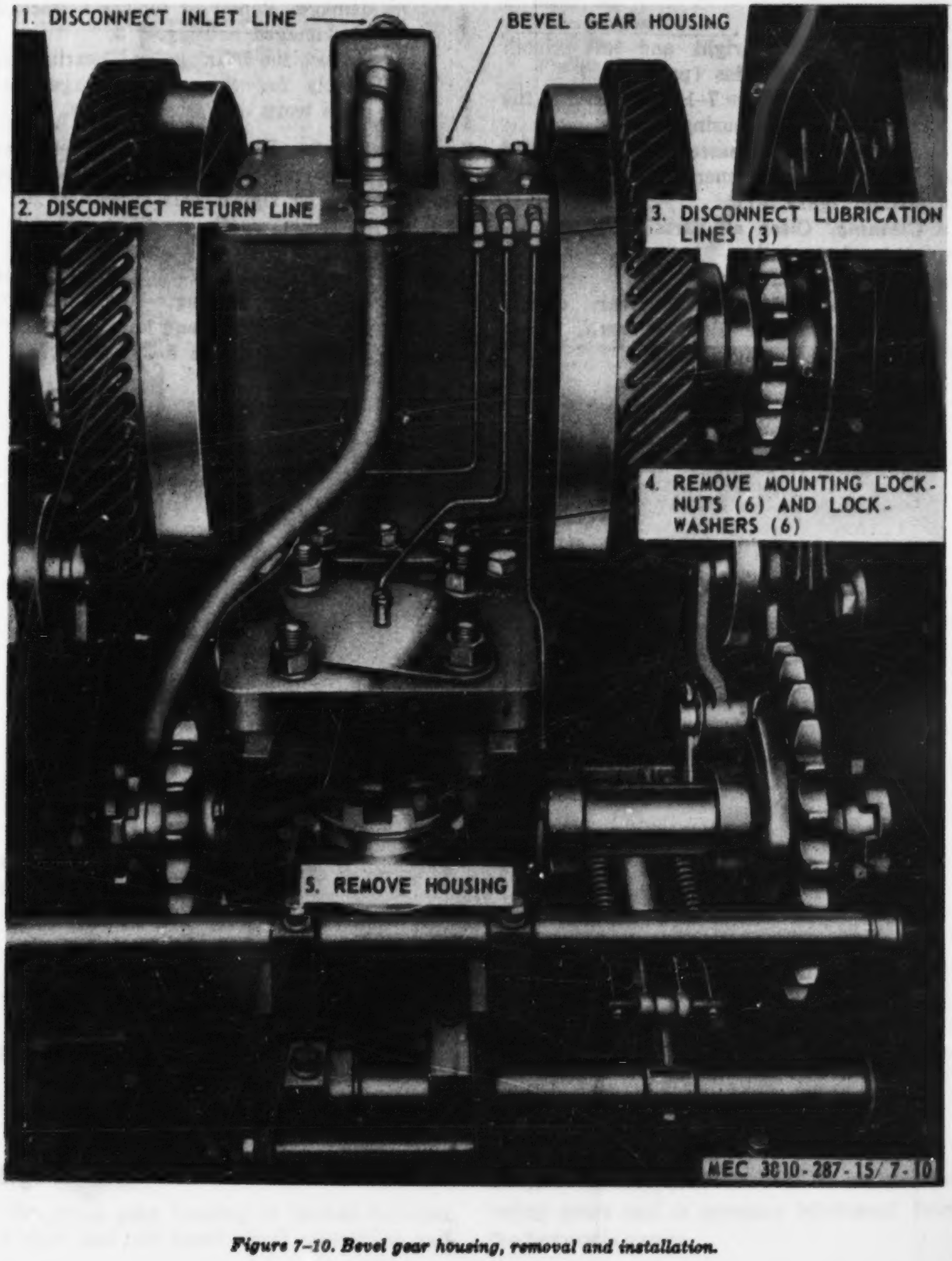
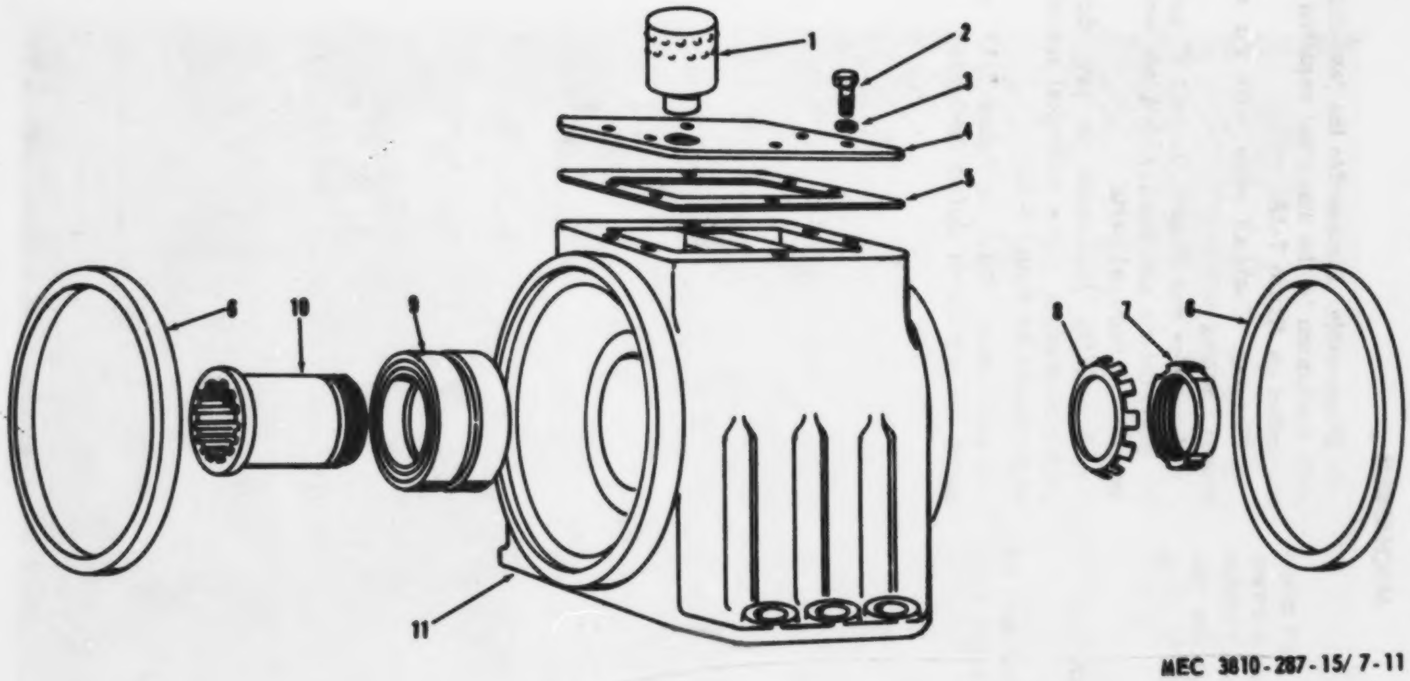

1. DISCONNECT INLET LINE
BEVEL GEAR HOUSING
2. DISCONNECT RETURN LINE
3. DISCONNECT LUBRICATION LINES (3)
4. REMOVE MOUNTING LOCK-NUTS (6) AND LOCK-WASHERS (6)
5. REMOVE HOUSING
MEC 3810-287-15/7-10

Figure 7-10. Bevel gear housing, removal and installation.


1
2
3
4
5
6
10
9
11
8
7
6
MEC 3810-287-15/7-11

1 Breather
2 Screw cap, 3/8 in. -16 x 3/4 in. (6)
3 Washer, lock, 3/8 in. (6)
4 Cover
5 Gasket
6 Seal (2)
7 Nut, lock
8 Washer, lock
9 Bearing
10 Sleeve
11 Bevel gear housing

Figure 7–11. Bevel gear housing, exploded view.

Section VII. SWING AND TRAVEL JAW CLUTCH SHIFT MECHANISM

7-17. General

The swing and travel jaw clutch shift mechanism is located on the turntable bed between the machinery side frames. The jaw clutches are shifted hydraulically and change the machine from swing to travel, or travel to swing as required.

7-18. Swing and Travel Jaw Clutch Shift Mechanism

a. Removal. Refer to figure 7-12 and remove the swing and travel jaw clutch shift mechanism.

b. Disassembly. Disassemble the jaw clutch shift mechanism in the numerical sequence as illustrated on figure 7-18.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective, or damaged parts.

e. Reassembly. Reassemble the jaw clutch shifter mechanism in the numerical sequence as illustrated on figure 7-18.

f. Installation. Refer to figure 7-12 and install the jaw clutch shifter mechanism.

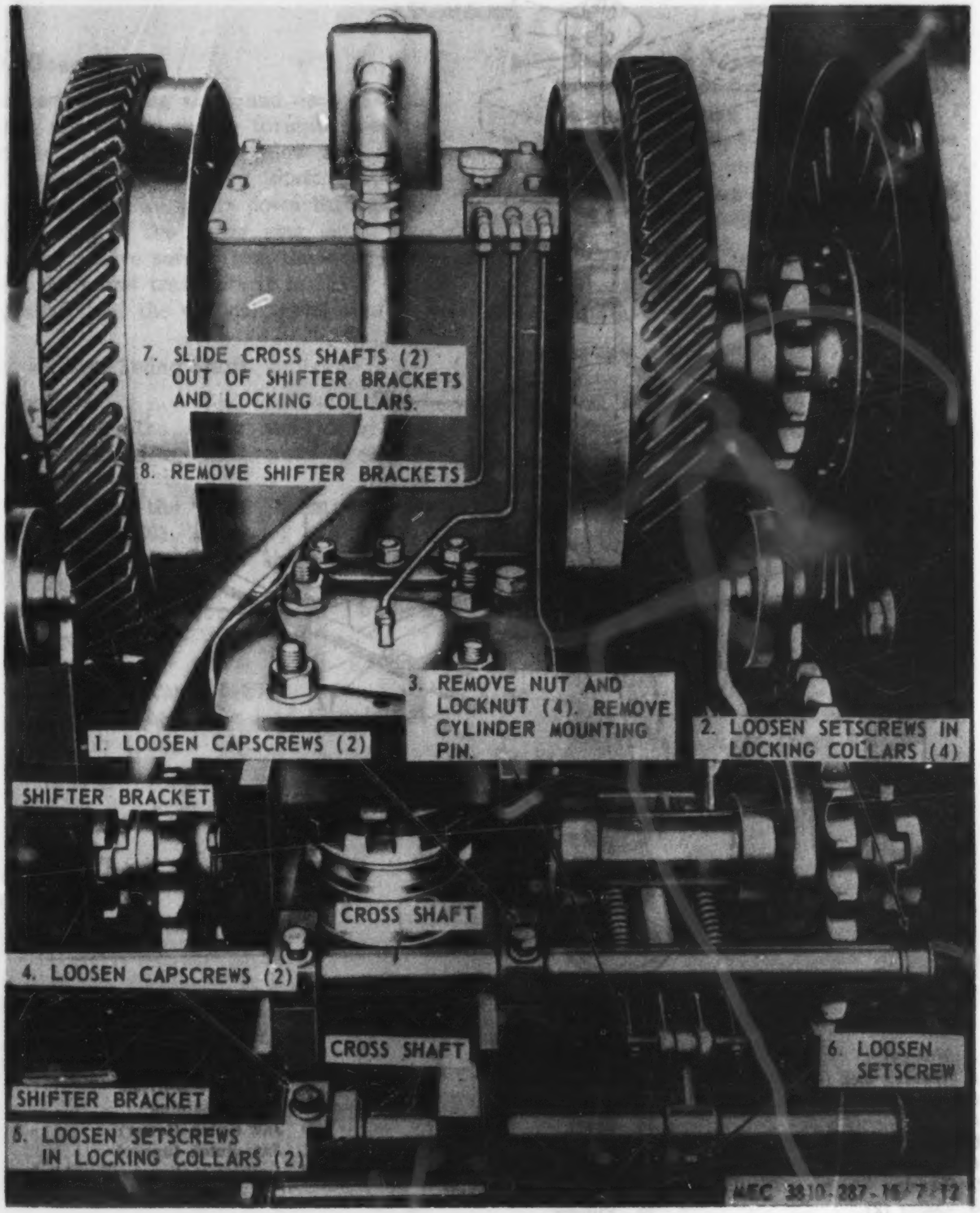
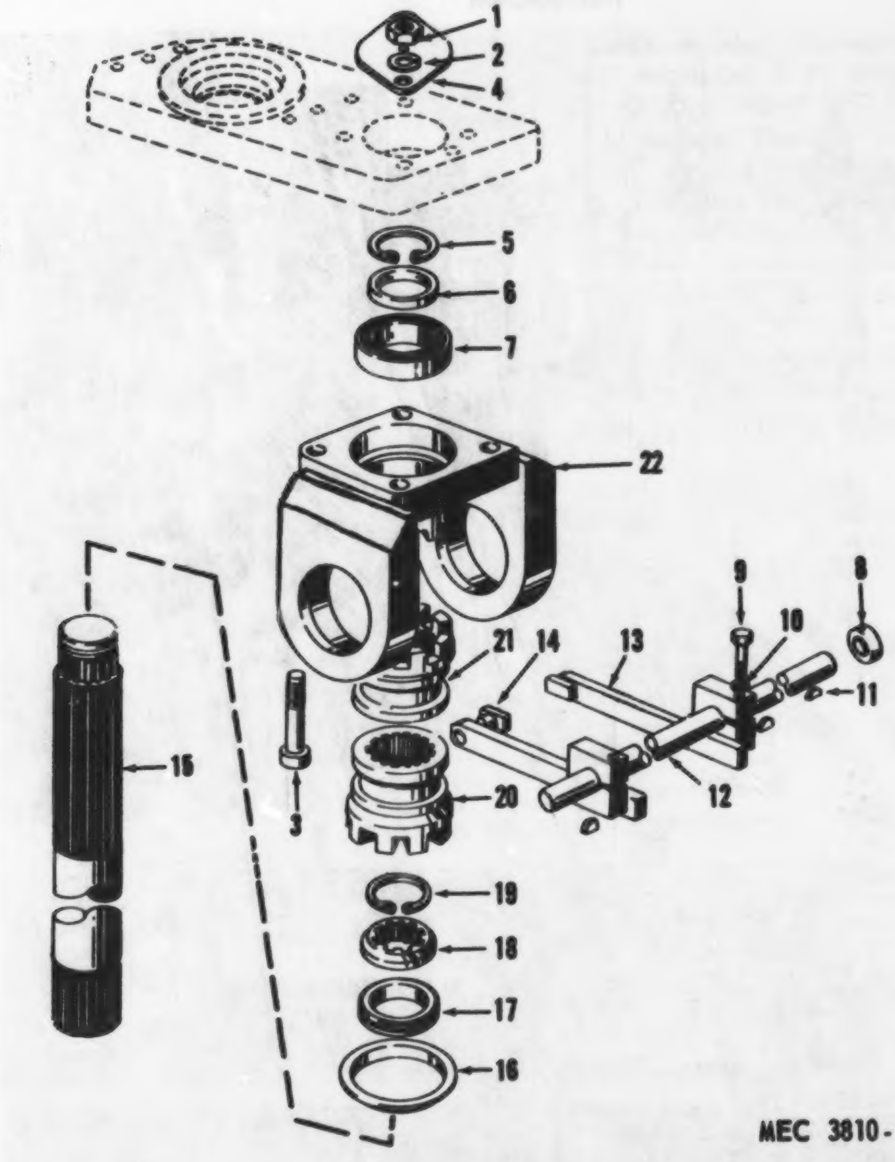

7. SLIDE CROSS SHAFTS (2) OUT OF SHIFTER BRACKETS AND LOCKING COLLARS.
8. REMOVE SHIFTER BRACKETS
3. REMOVE NUT AND LOCKNUT (4). REMOVE CYLINDER MOUNTING PIN.
1. LOOSEN CAPSCREWS (2)
2. LOOSEN SETSCREWS IN LOCKING COLLARS (4)
SHIFTER BRACKET
CROSS SHAFT
4. LOOSEN CAPSCREWS (2)
CROSS SHAFT
6. LOOSEN SETSCREW
SHIFTER BRACKET
5. LOOSEN SETSCREWS IN LOCKING COLLARS (2)
MEC 3810-287-15/7-12

Figure 7-18. Swing and travel jaw clutch shift mechanism, removal and installation.



MEC 3810-287-15/ 7-13

1 Nut (4)
2 Washer, lock (4)
3 Screw, cap (4)
4 Cover
5 Ring retaining
6 Washer, thrust
7 Bearing
8 Collar (2)
9 Screw, cap (2)
10 Washer, lock (2)
11 Key (3)
12 Shaft
13 Shifter yoke (2)
14 Shifter shoe (2)
15 Vertical swing shaft
16 Flinger
17 Seal, ring
18 Washer seal-nylon
19 Ring, retaining
20 Jaw clutch (lower)
21 Jaw clutch (upper)
22 Locking rack and pillow block

Figure 7-13. Swing and travel jaw clutch shift mechanism, exploded view.

Section VIII. VERTICAL SWING SHAFT AND DECK GEAR ASSEMBLIES

7-19. General

The vertical swing shaft and deck gear assemblies are located in the turntable bed between the side frames and below the drumshaft assembly. The swing shaft transmits power from the deck gears down through the turntable bed to the swing ring gear. The deck gears receive power from the vertical reversing shaft and transmits it to the vertical swing shaft and the vertical travel shaft.

7-20. Vertical Swing Shaft

a. Removal.

(1) Remove the swing and travel jaw clutch shifter mechanism (para 7-12).

(2) Remove the third drum assembly (para 5-30).

(3) Remove the clutch shaft assemblies (para 5-32).

(4) Remove the bevel gear housing (para 7-16).

(5) Remove the power boom lowering assembly (para 5-27).

(6) Remove the power load lowering assembly (para 5-28).

(7) Remove the swing and travel jaw clutch shift mechanism (para 7-18).

(8) Remove rotating joints (para 8-8).

(9) Refer to figure 7-14 and remove the vertical swing shaft assembly.

b. Disassembly. Disassemble the vertical swing shaft in the numerical sequence as illustrated on figure 7-15.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair.

(1) Inspect all parts for wear, defects, and damage. Replace worn, defective, or damaged parts.

(2) Inspect the bearings, shaft and gear for wear and damage. Replace worn or damaged parts.

e. Reassembly. Reassemble the vertical swing shaft assembly in reverse of the numerical sequence as illustrated on figure 7-15.

f. Installation.

(1) Refer to figure 7-14 and install the vertical reversing shaft assembly.

(2) Install the swing and travel jaw clutch shifter mechanism (para 7-16).

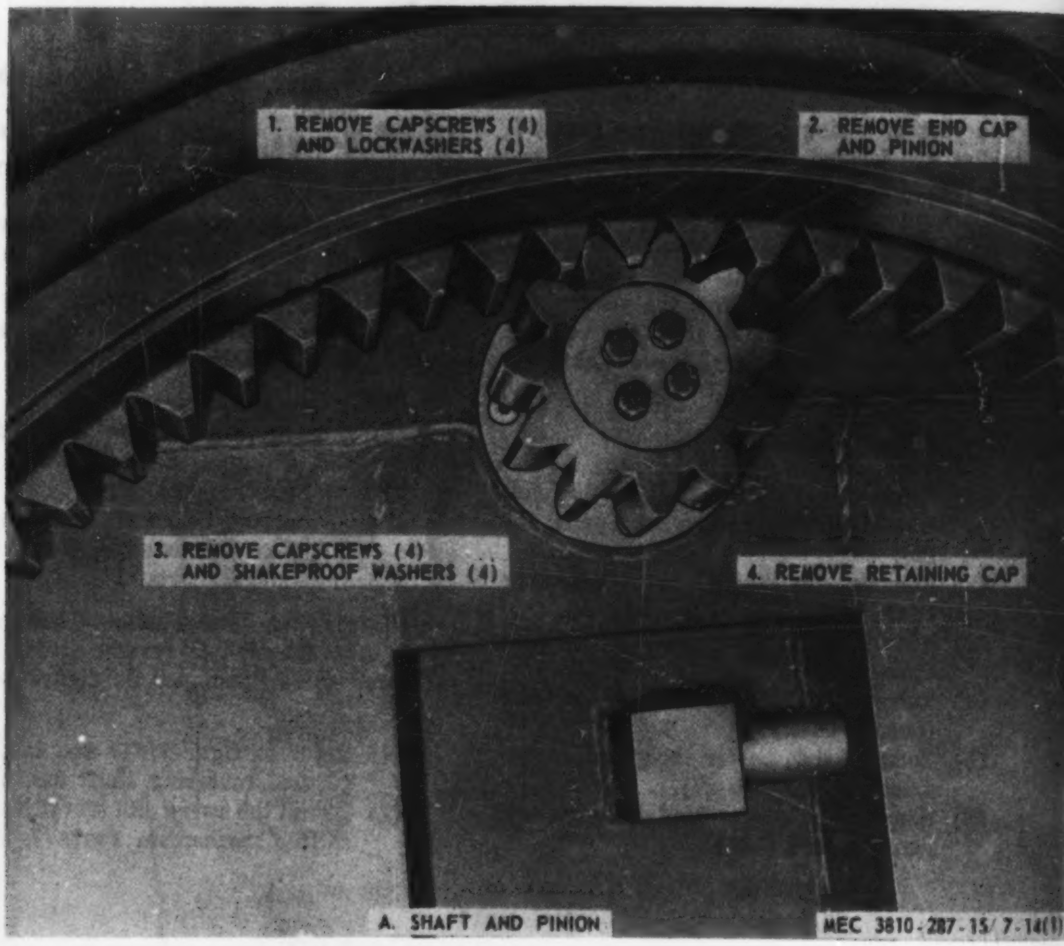

1. REMOVE CAPSCREWS (4) AND LOCKWASHERS (4)
2. REMOVE END CAP AND PINION
3. REMOVE CAPSCREWS (4) AND SHAKEPROOF WASHERS (4)
4. REMOVE RETAINING CAP
A. SHAFT AND PINION
MEC 3810-287-15/7-14(1)

Figure 7-14 (1). Vertical swing shaft assembly, removal and installation.

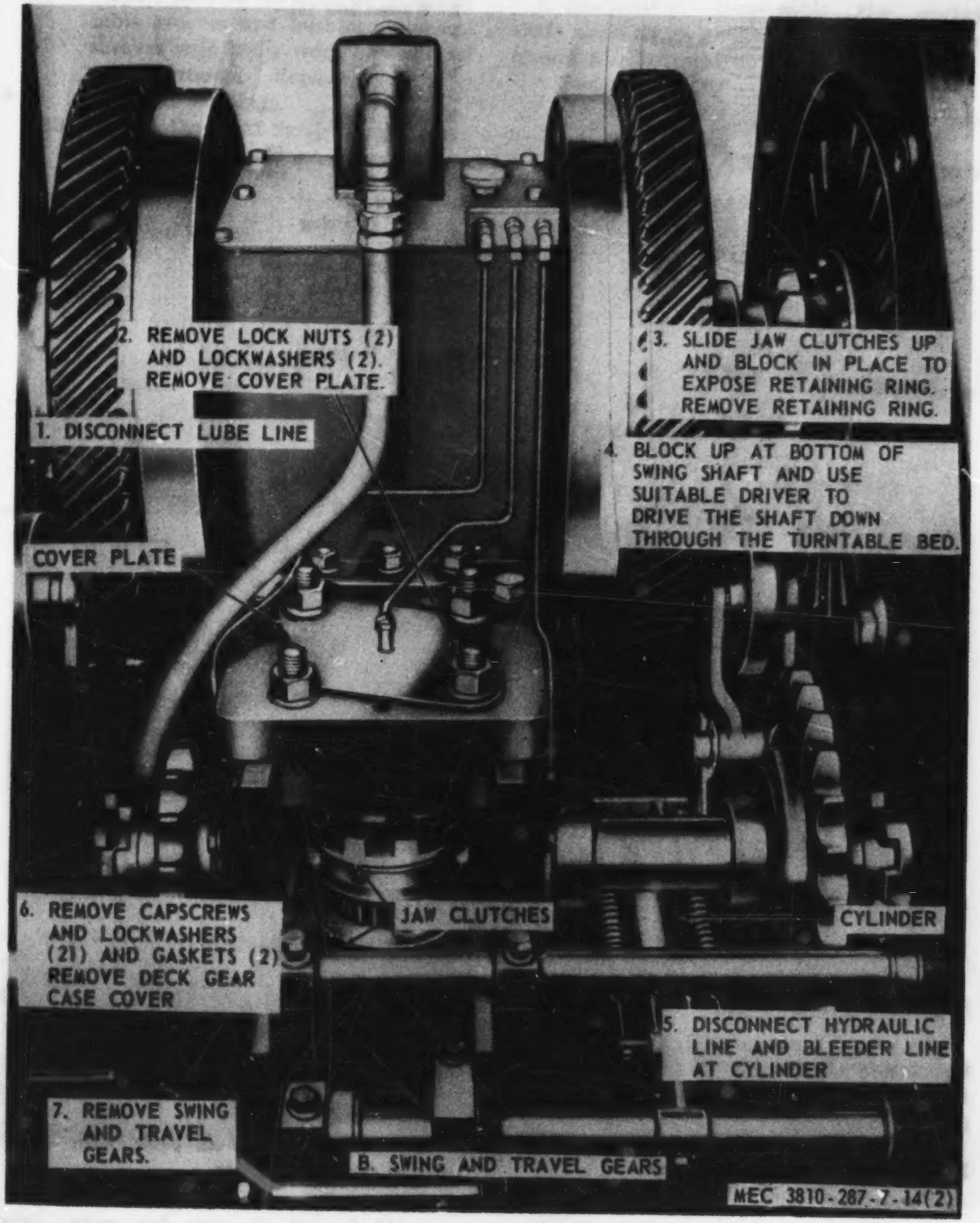
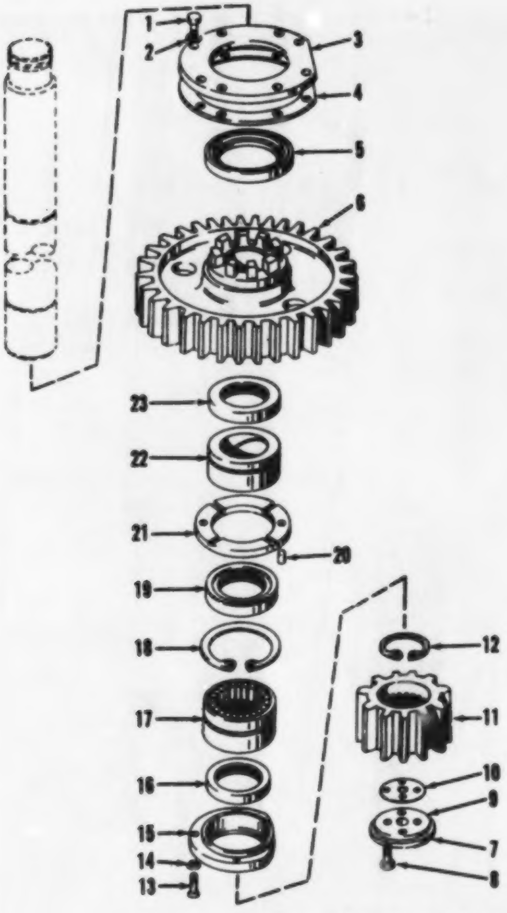

2. REMOVE LOCK NUTS (2) AND LOCKWASHERS (2). REMOVE COVER PLATE.
3. SLIDE JAW CLUTCHES UP AND BLOCK IN PLACE TO EXPOSE RETAINING RING. REMOVE RETAINING RING.
1. DISCONNECT LUBE LINE
4. BLOCK UP AT BOTTOM OF SWING SHAFT AND USE SUITABLE DRIVER TO DRIVE THE SHAFT DOWN THROUGH THE TURNTABLE BED.
COVER PLATE
6. REMOVE CAPSCREWS AND LOCKWASHERS (21) AND GASKETS (2) REMOVE DECK GEAR CASE COVER
JAW CLUTCHES
CYLINDER
5. DISCONNECT HYDRAULIC LINE AND BLEEDER LINE AT CYLINDER
7. REMOVE SWING AND TRAVEL GEARS.
B. SWING AND TRAVEL GEARS
MEC 3810-287-7-14(2)

Figure 7-14 (2).—Continued.



IMEC 3810-287-15/7-15

Figure 7-15. Vertical swing shaft assembly, exploded view.

1	Screw, cap (8)
2	Washer, lock (8)
3	Plate
4	Gasket
5	Seal
6	Gear
7	Wire, lock (2)
8	Screw, cap (4)
9	Cap, end
10	Shim
11	Pinion
12	Ring, retaining
13	Screw (4)
14	Washer, shakeproof
15	Cap, retaining
16	Seal
17	Bearing
18	Ring, retaining
19	Seal
20	Pin, dowel
21	Washer, thrust
22	Bushing
23	Seal

Figure 7-15.—Continued.

Section IX. GANTRY SHAFT ASSEMBLY

7-21. General

The gantry shaft assembly is located at the top of and attached to the machinery side frames. It supports the boom hoist sheave and gantry bridle.

7-22. Gantry Shaft Assembly

a. Removal.

(1) Lower the boom to the ground and remove the boom hoist cable (para 2-21).

(2) Refer to figure 7-16 and remove the gantry shaft assembly.

b. Disassembly. Disassemble the gantry shaft assembly in the numerical sequence as illustrated on figure 7-17.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Repair or replace worn, defective or damaged parts.

(2) Inspect sheaves for worn or damaged cable grooves and bushings. Replace sheaves with badly worn or damaged cable grooves. Replace worn or damaged bushings.

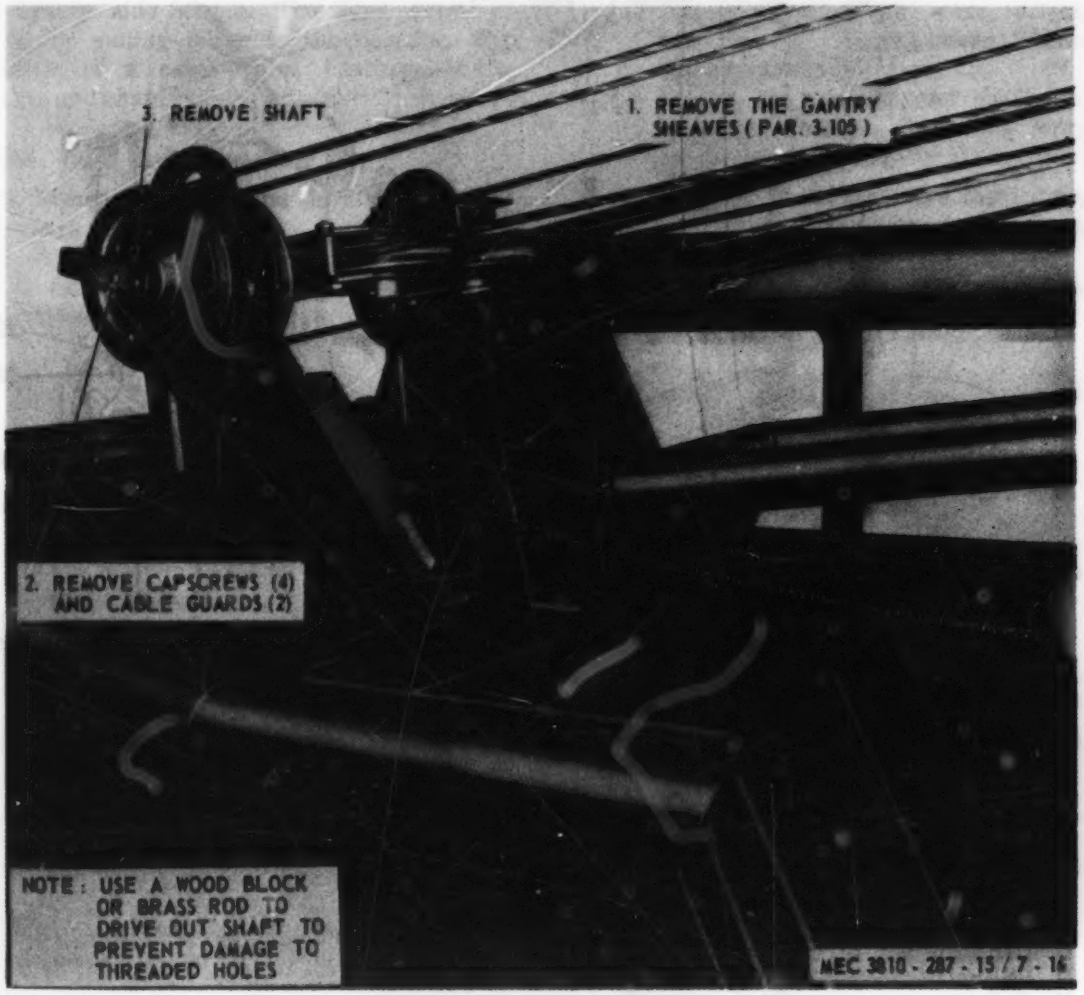
(3) Inspect the shaft for excessive wear and damage. Replace a worn or damaged shaft.

e. Reassembly. Reassemble the gantry shaft assembly in reverse of the numerical sequence as illustrated on figure 7-17.

f. Installation.

(1) Refer to figure 7-16 and install the gantry shaft assembly.

(2) Install the boom hoist cable (para 2-6).



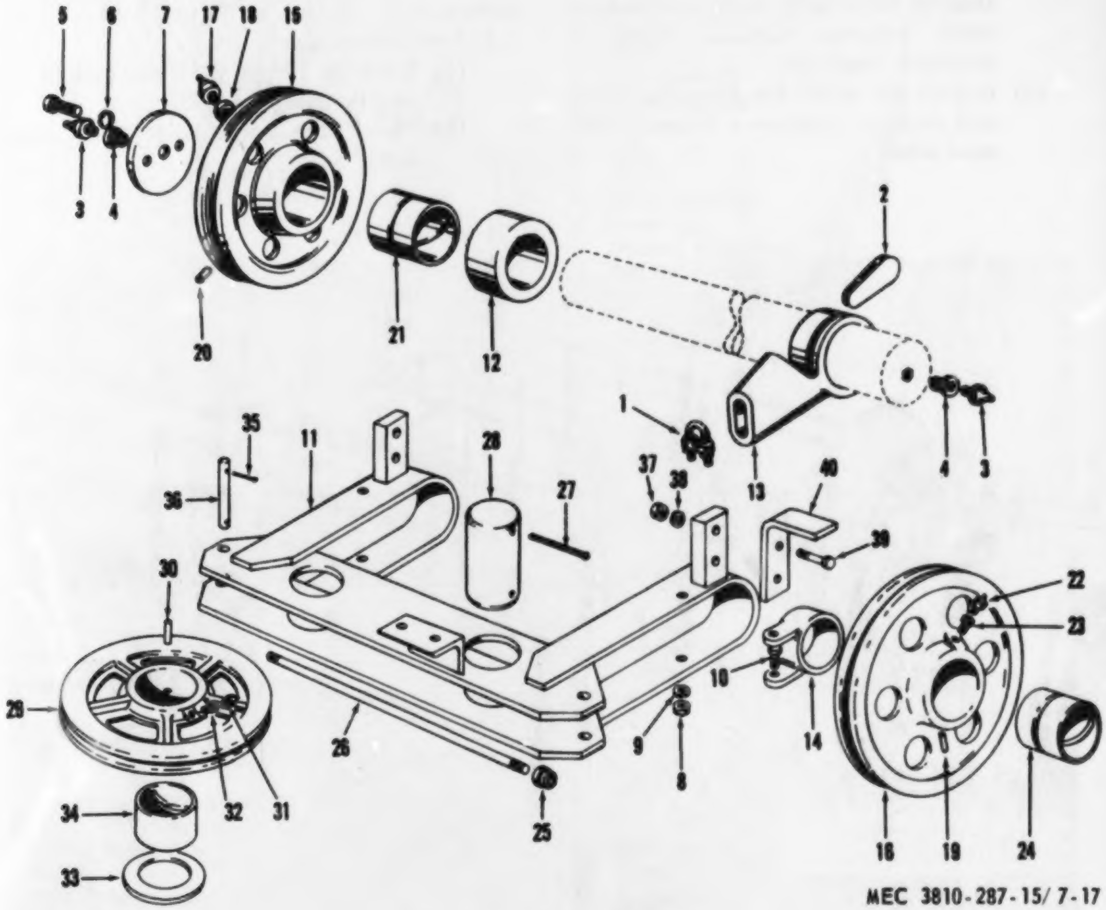
3. REMOVE SHAFT

1. REMOVE THE GANTRY SHEAVES (PAR. 3-105)

2. REMOVE CAPSCREWS (4) AND CABLE GUARDS (2)

NOTE: USE A WOOD BLOCK OR BRASS ROD TO DRIVE OUT SHAFT TO PREVENT DAMAGE TO THREADED HOLES

Figure 7-16. Gantry shaft assembly, removal and installation.


5
6
7
17
18
15
3
4
2
21
20
12
1
4
3
13
35
11
28
27
37
38
40
36
39
30
22
23
10
29
26
9
14
8
34
32
31
25
33
16
19
24

MEC 3810-287-15/7-17

1 Clamp, cable
2 Wedge
3 Pipe, grease fitting (2)
4 Bushing (2)
5 Screw, cap
6 Washer
7 Plate
8 Nut, 1/2"—20 (4)
9 Washer, lock— 1/2" (4)
10 Screw, 1/2"—20 x 1 3/4 in. lg. (4)
11 Harness frame
12 Collar
13 Socket
14 Bushing (2)
15 Sheave
16 Sheave
17 Pipe, grease fitting
18 Bushing
19 Dowel
20 Dowel
21 Bushing
22 Pipe, grease fitting
23 Bushing
24 Bushing
25 Nut, stop
26 Rod
27 Pin, cotter (2)
28 Pin (2)
29 Sheave (2)
30 Dowel (2)
31 Pipe, grease fitting (2)
32 Bushing (2)
33 Spacer

Figure 7-17. Gantry shaft assembly, exploded view.

34 Bushing
35 Pin, cotter (4)
36 Pin (2)
37 Nut, 1/2"—13 (4)
38 Washer, lock —1/2" (4)
39 Screw, 1/2"—13 NC x 2 1/4 in. lg. (4)
40 Guard

Figure 7-17.—Continued.

Section X. THIRD DRUM ASSEMBLY

7-23. General

The third drum assembly is mounted near the front of the turntable bed between the machinery side frames. The third drum is used for pulling piling to the machine and consists of a cable drum, bearings, shaft, brakes and chain.

7-24. Third Drum Assembly

a. Removal. Remove the third drum assembly (para 5-30).

b. Disassembly. Disassemble the third drum assembly in the numerical sequence as illustrated on figure 7-18.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

(2) Inspect the bearings and shaft for wear and damage. Replace a worn or damaged bearing or shaft.

e. Reassembly. Reassemble the third drum assembly in reverse of the numerical sequence as illustrated on figure 7-18.

f. Installation. Install the third drum assembly (para 5-30).

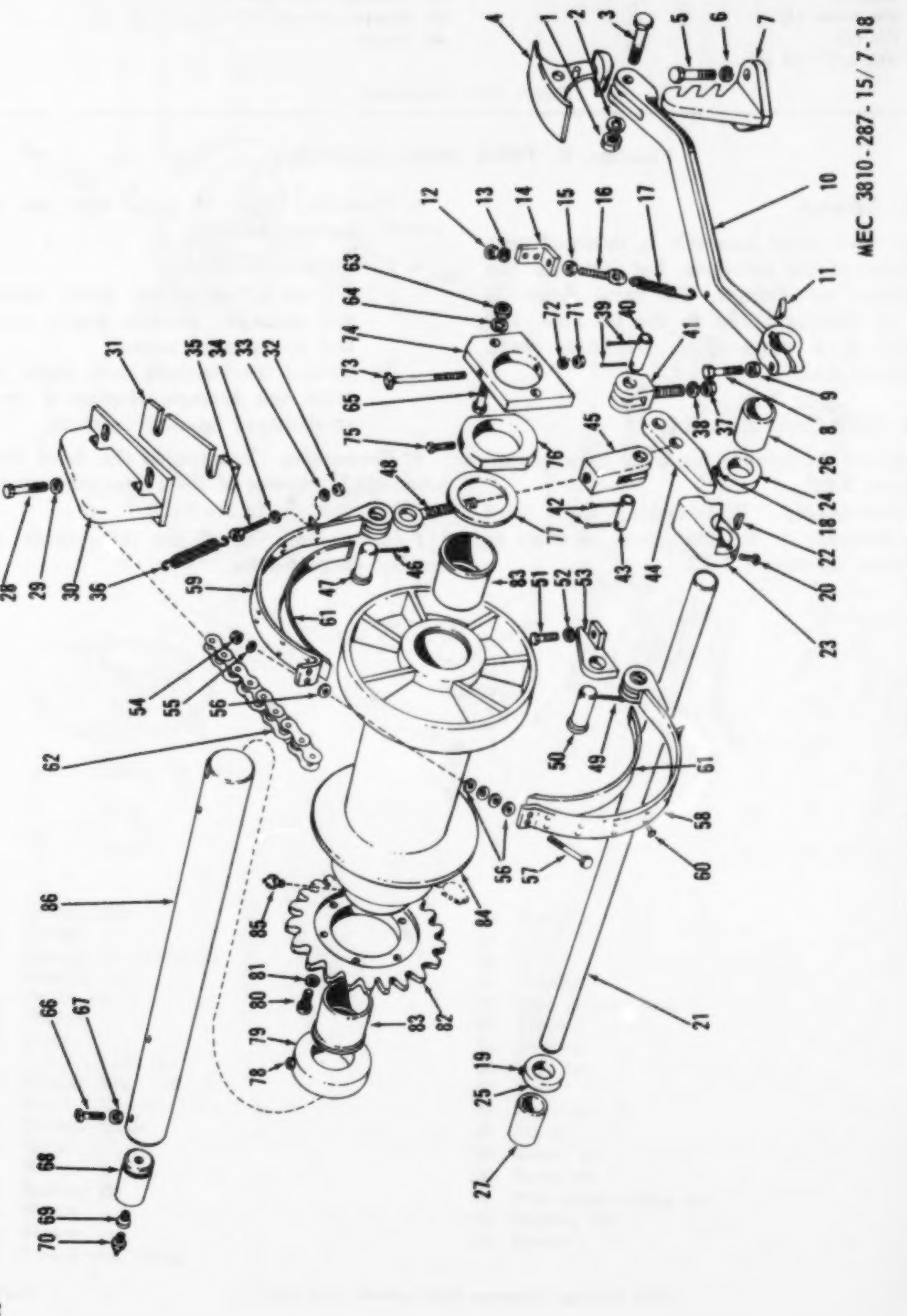

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
MEC 3810-287-15/7-18

Figure 7–18. Third drum assembly, exploded view.

1	Nut
2	Washer, lock
3	Bolt
4	Pedal
5	Screw, cap (2)
6	Washer, lock (2)
7	Pedal lock
8	Screw, cap
9	Nut, lock
10	Lever
11	Key
12	Nut
13	Washer, lock
14	Bracket
15	Nut, lock
16	Bolt, eye
17	Spring
18	Screw, set
19	Screw, set
20	Screw, cap
21	Shaft
22	Key
23	Cam
24	Collar
25	Collar
26	Bushing
27	Bushing
28	Screw, cap (2)
29	Washer, lock (2)
30	Bracket
31	Shim
32	Nut
33	Washer
34	Nut
35	Bolt, eye
36	Spring
37	Nut
38	Washer, lock
39	Pin, cotter (2)
40	Pin
41	Yoke
42	Pin, cotter
43	Pin (2)
44	Lever
45	Yoke
46	Pin, cotter
47	Pin
48	Bolt, eye
49	Pin, cotter
50	Pin
51	Screw, cap (2)
52	Washer, lock
53	Bracket
54	Nut
55	Washer, lock
56	Washer, flat (9)
57	Bolt
58	Brake band
59	Brake band
60	Rivet (12)
61	Brake band
62	Chain
63	Nut
64	Washer, lock (2)
65	Bolt (2)
66	Screw, cap
67	Nut
68	Plug
69	Bushing
70	Fitting, grease
71	Nut
72	Washer, lock
73	Bolt
74	Plate
75	Screw, set
76	Collar
77	Washer, thrust
78	Screw, set
79	Collar
80	Screw, cap (6)
81	Washer, lock (6)
82	Sprocket
83	Bushing
84	Drum, cable
85	Fitting, grease
86	Shaft

Figure 7-18.—Continued.

Section XI. SHEARBALL ASSEMBLY

7-25. General

The shearball assembly is located between the turntable bed and the crawler assembly. It is the rotating connection for the turntable bed. The shearball is similar in design to a large roller bearing in which the outer bearing race is attached to the turntable and the inner race to the crawler. The balls between the two races support the turntable.

7-26. Shearball Assembly

a. Removal.

(1) Remove the counterweight (para 7-30).

(2) Refer to figure 2-2 (1) and connect the lifting slings as shown.

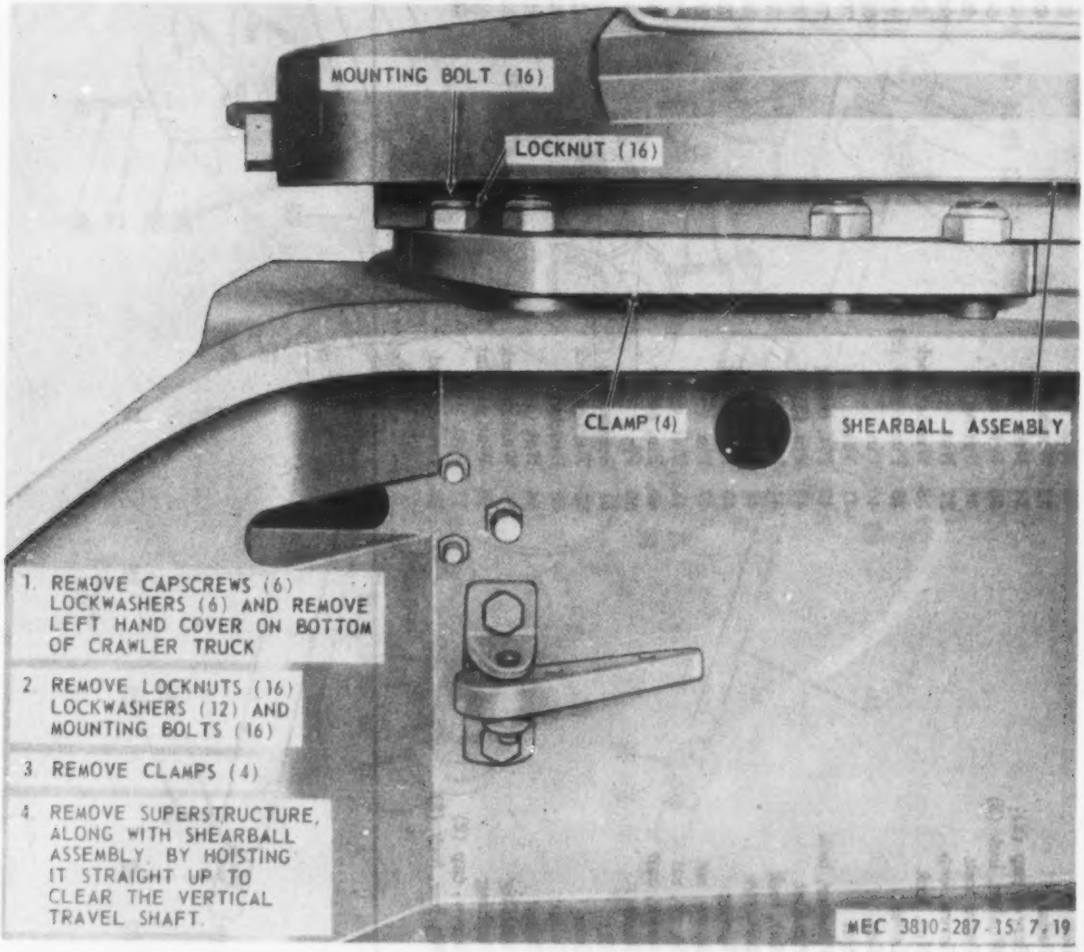
(3) Remove the center journal rotating joint (para 8-8).

(4) Refer to figure 7-19 and remove the shearball assembly.

Note. The shearball outer race is welded to the turntable bed and should not be removed unless badly worn or damaged.

b. Disassembly. Disassemble the shearball assembly in the numerical sequence as illustrated on figure 7-20.

c. Cleaning. Clean all parts with an approved cleaning solution.



1. REMOVE CAPSCREWS (6) LOCKWASHERS (6) AND REMOVE LEFT HAND COVER ON BOTTOM OF CRAWLER TRUCK
2. REMOVE LOCKNUTS (16) LOCKWASHERS (12) AND MOUNTING BOLTS (16)
3. REMOVE CLAMPS (4)
4. REMOVE SUPERSTRUCTURE, ALONG WITH SHEARBALL ASSEMBLY, BY HOISTING IT STRAIGHT UP TO CLEAR THE VERTICAL TRAVEL SHAFT.

Figure 7-19. Shearball assembly, removal and installation.

d. Inspection and Repair.

(1) Inspect all parts for wear, defects, and damage. Replace worn, defective, or damaged parts.

(2) Inspect the balls and ball races for signs of excessive wear, scoring, pits, and other damage. Replace worn or damaged parts.

(3) Inspect the spacers and seals for wear and damage. Replace worn or damaged spacers or seals.

e. Reassembly. Reassemble the shearball assembly in reverse of the numerical sequence as illustrated on figure 7-20.

f. Installation.

(1) Refer to figure 2-2 (1) and connect lifting slings as shown.

(2) Refer to figure 7-19 and install the shearball assembly.

(3) Install the center journal rotating joint (para 8-8).

(4) Install the counterweight (para 7-30).

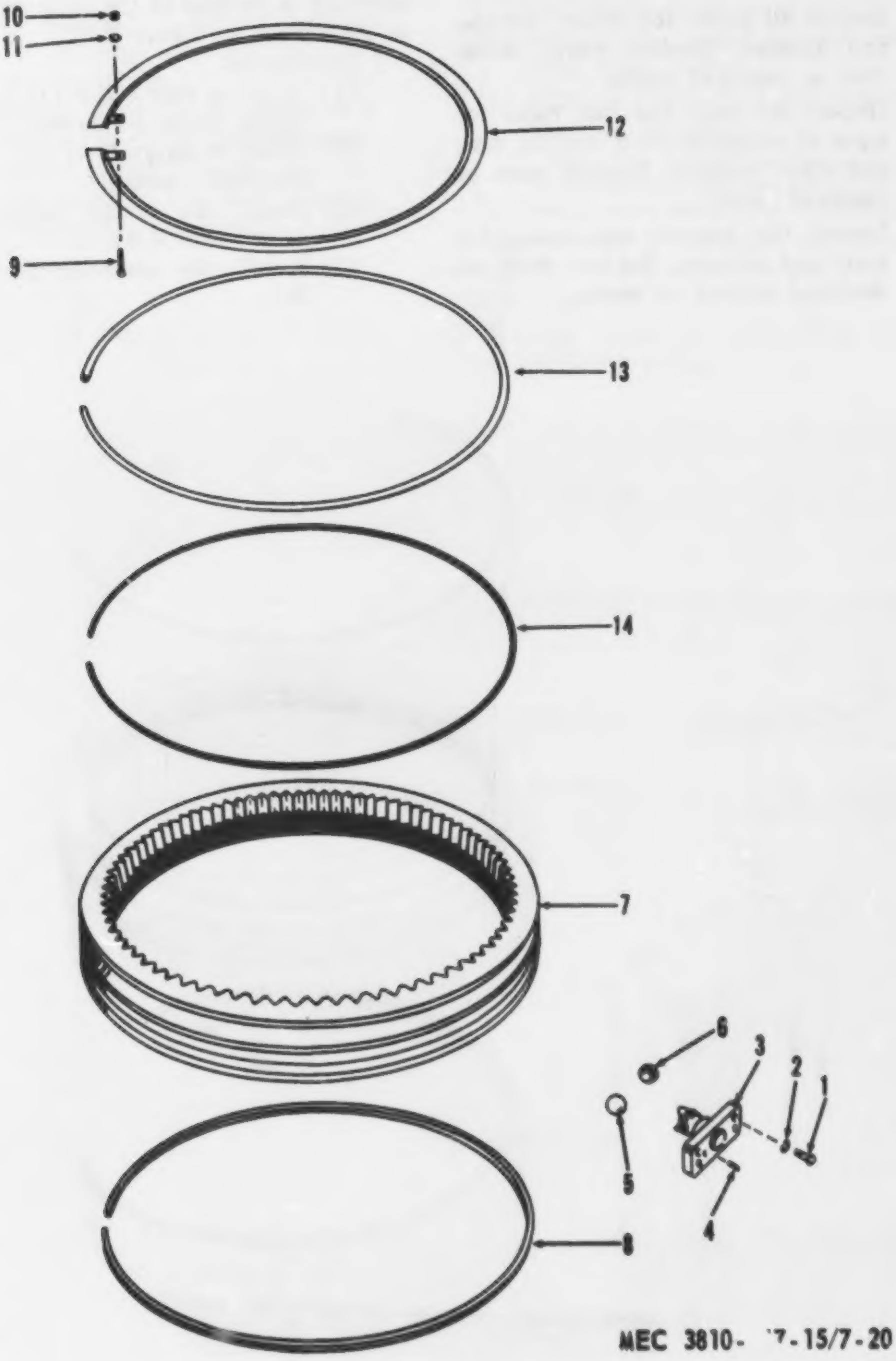

10
11
12
9
13
14
7
6
3
2
1
5
4
8
MEC 3810- '7-15/7-20

Figure 7-20. Shearball assembly, exploded view.

1 Screw, cap (2)
2 Washer, lock (2)
3 Plug
4 Dowel (2)
5 Ball (72)
6 Spacer (72)
7 Inner race and ring gear
8 Seal
9 Bolt
10 Nut
11 Washer, lock
12 Retainer
13 Tube
14 Spring

Figure 7-20.—Continued.

Section XII. TURNTABLE BED

7-27. General

The turntable bed is the main structure of the crane-shovel and contains the operating controls, engine, machinery and counterweight.

7-28. Turntable Bed

a. Removal. Refer to paragraph 5-31 and remove the turntable bed assembly.

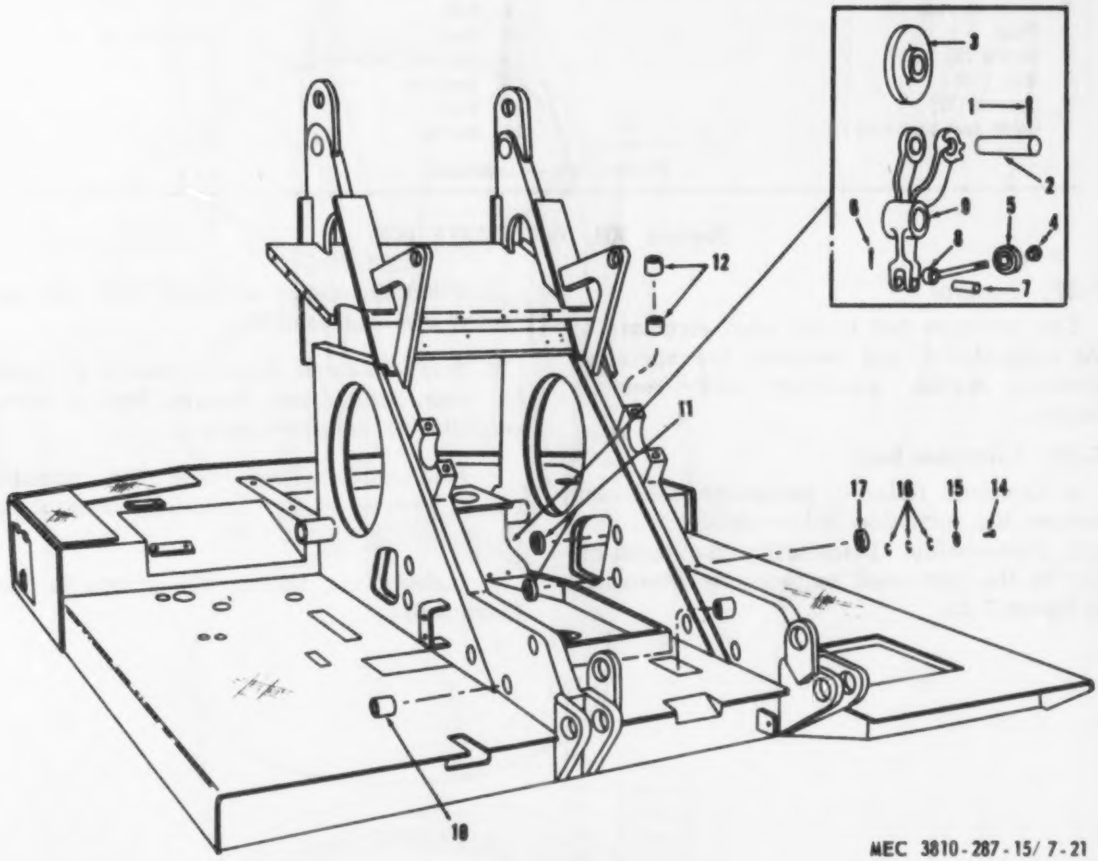
b. Disassembly. Disassemble the turntable bed in the numerical sequence as illustrated on figure 7-21.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects, and damage. Replace worn, defective, or damaged parts.

e. Reassembly. Reassemble the turnable bed in reverse of the numerical sequence as illustrated on figure 7-21.

f. Installation. Install the turntable bed (para 5-31).



MEC 3810-287-15/7-21

1	Pin, cotter
2	Pin, roller
3	Roller
4	Nut, lock
5	Spacer
6	Pin, cotter
7	Pin, adjusting bolt
8	Bolt, adjusting
9	Bracket, roller
10	Bushing
11	Bushing (2)
12	Bushing (2)
13	Bushing
14	Screw, cap
15	Washer
16	Washer, lock (3)
17	Bushing

Figure 7-21. Turntable bed assembly, exploded view.

Section XIII. CAB ASSEMBLY

7-29. General

The cab assembly is located on the turntable bed and encloses the machinery and operator's compartment. It consists of sheet metal panels, doors, glass and miscellaneous hardware. The cab is constructed in a manner which allows it to be removed as an assembly or by individual panels as required.

7-30. Cab Assembly

a. Removal. Refer to paragraph 5-24 and remove the cab assembly.

b. Disassembly. Disassemble the cab assembly in the numerical sequence as illustrated on figure 7-22.

c. Cleaning. Clean all parts with an approved cleaning solution.

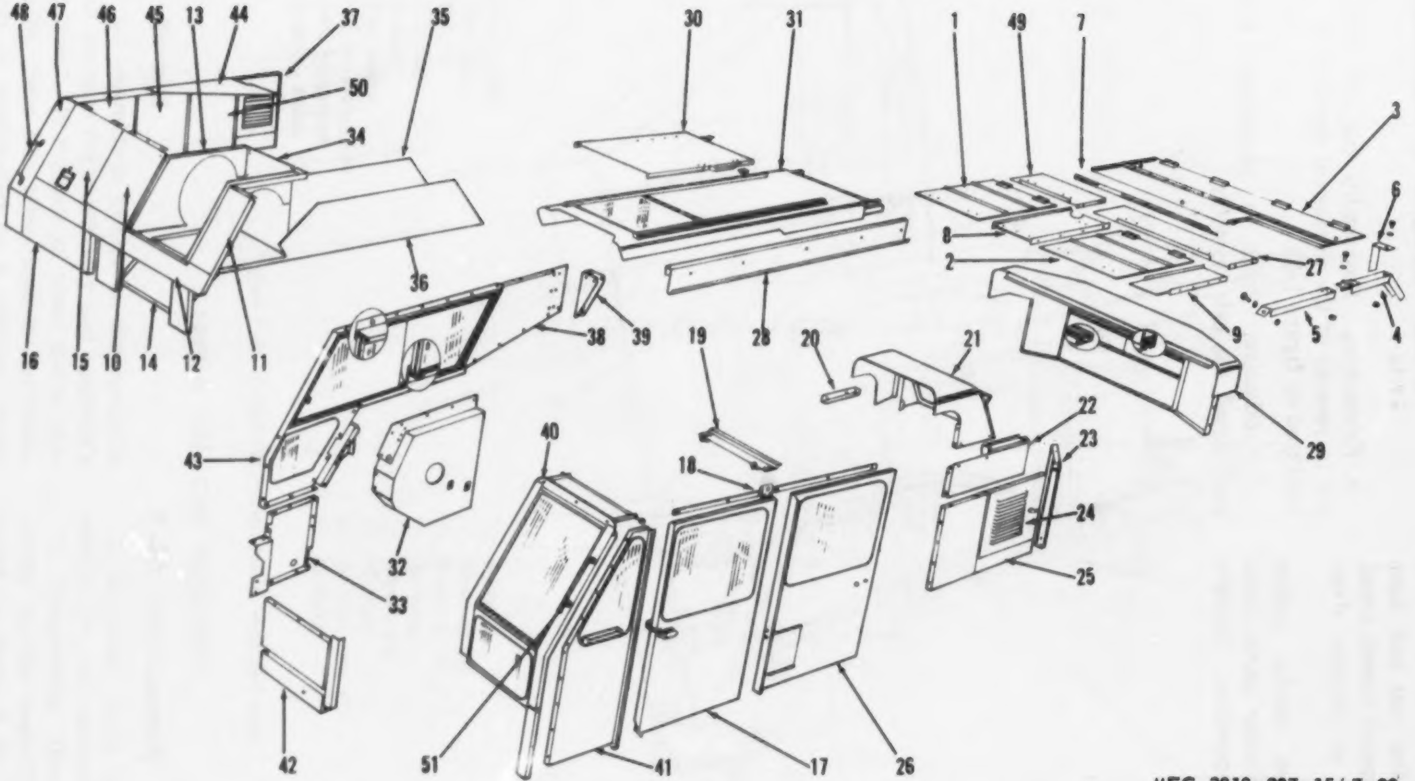
d. Inspection and Repair.

(1) Inspect all parts for rust and damage. Clean and repaint rusted areas. Straighten, repair or replace damaged panels.

(2) Inspect all handles, tracks, rollers and latches for missing parts, damage and proper operation. Replace missing, damaged or inoperative parts.

e. Reassembly. Reassemble the cab assembly in reverse of the numerical sequence as illustrated on figure 7-22.

f. Installation. Refer to paragraph 5-24 and install the cab assembly.


48
47
46
45
13
44
37
50
34
35
30
31
1
49
7
3
6
8
2
27
5
4
9
29
16
15
10
14
12
11
36
38
39
19
28
20
21
22
23
24
25
43
40
18
32
33
42
51
41
17
26

MEC 3810-287-15/ 7-22

1	Door
2	Door
3	Top door
4	Guard
5	Guard
6	Strap
7	Roof strip
8	Center panel
9	Roof panel
10	Dirt trough
11	Front panel
12	Front panel
13	Drum guard
14	Dirt trough
15	Hinged door
16	Front panel
17	Sliding door
18	Hanger, track
19	Header
20	Track extension
21	Operator's roof
22	Panel
23	Corner post
24	Left door

Figure 7-62. Cab assembly, exploded view.

25	Door sill
26	Panel
27	Roof header
28	Track cover
29	Roof cap
30	Roof visor
31	Front roof
32	Chain guard
33	Side panel
34	Panel
35	Dirt trough
36	Dirt trough
37	Right door
38	Panel
39	Stiffener
40	Front panel
41	Front panel
42	Control cover
43	Right panel
44	Roof
45	Side panel
46	Side panel
47	Front post
48	Handle
49	Roof header
50	Panel
51	Handle

Figure 7–33.—Continued.

Section XIV. COUNTERWEIGHT

7-31. General

The counterweight is mounted to the rear of the turntable bed and is of the removable type. Its primary function is to provide machine stability by offsetting the load being handled.

7-32. Counterweight Assembly

a. Removal. Refer to figure 7-23 and remove the counterweight.

b. Cleaning. Clean with an approved cleaning solution.

c. Inspection and repair. Inspect for rust and damage. Clean and paint rusted areas. Repair or replace damaged mounting bolts.

d. Installation. Refer to figure 7-23 and install the counterweight.

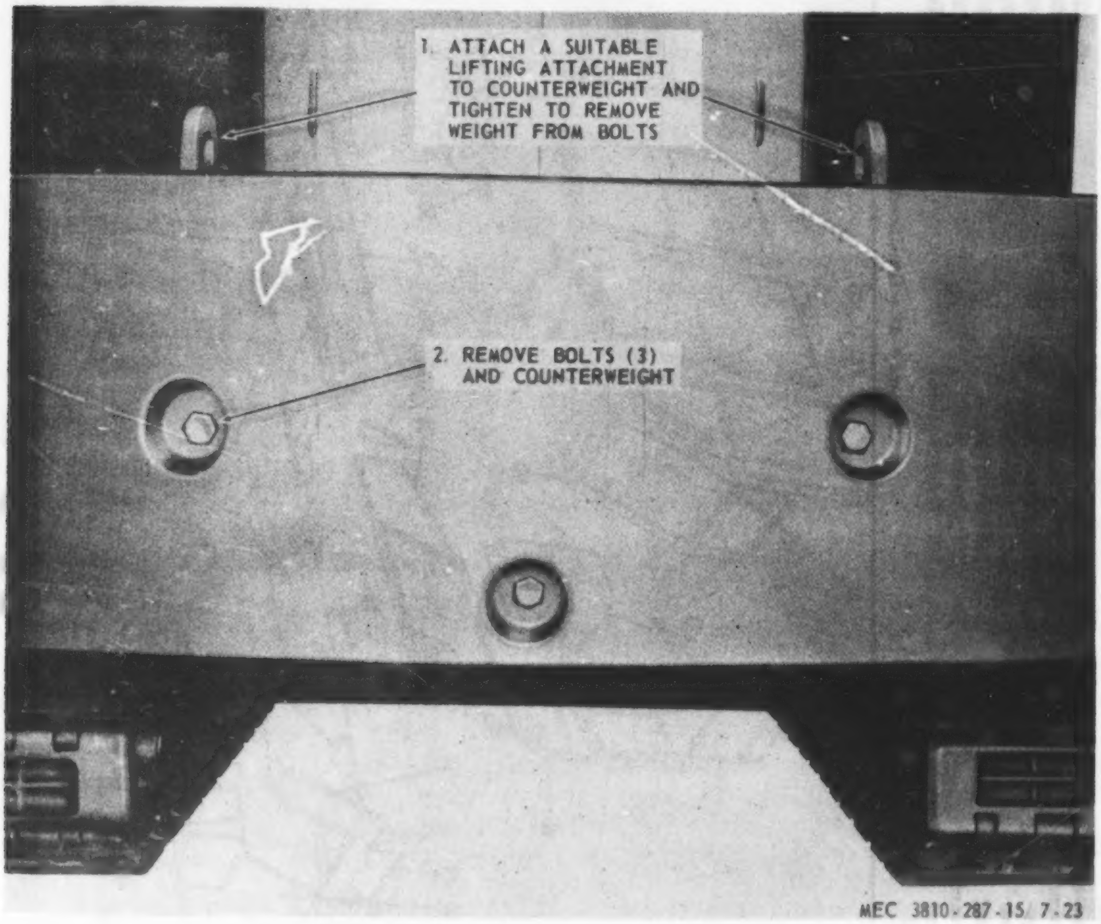

1. ATTACH A SUITABLE LIFTING ATTACHMENT TO COUNTERWEIGHT AND TIGHTEN TO REMOVE WEIGHT FROM BOLTS
2. REMOVE BOLTS (3) AND COUNTERWEIGHT
MEC 3810-287-15/7-23

Figure 7-23. Counterweight, removal and installation.

CHAPTER 8

CRAWLER ASSEMBLY REPAIR INSTRUCTIONS

Section I. CRAWLER BELTS AND SIDE FRAMES

8-1. General

This section covers repair of the crawler belts, side frames, rollers, drive sprockets, and chains.

8-2. Crawler Belts

a. General. The crawler belts are located on each side of the crawler frame assembly and mounted on the crawler side frames. They are chain driven from the crawler cross-travel shaft and provide the propelling and steering action of the machine.

b. Removal.

(1) Refer to paragraph 3-22 and loosen the front crawler belt adjustment.

(2) Refer to paragraph 3-107 and remove the crawler belts.

c. Disassembly. Disassemble the crawler belt assembly in the numerical sequence as illustrated on figure 8-1.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

(2) Inspect the pads and pins for excessive wear. Replace worn parts.

(3) Inspect for loose or missing lock pins. Tighten loose pins and install new ones as required.

f. Reassembly. Reassemble the crawler belt assembly in reverse of the numerical sequence as illustrated on figure 8-1.

g. Installation.

(1) Refer to paragraph 3-107 and install the crawler belt assemblies.

(2) Refer to paragraph 3-22 and adjust the crawler belt assemblies.

8-3. Crawler Drive Chains

a. General. The crawler drive chains are located at the rear and inside of the crawler side frames. The chains extend from the outer cross-travel shaft sprockets to the crawler chain drive sprockets.

b. Removal. Refer to paragraph 3-106 and remove the crawler drive chains.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

(2) Inspect the roller, side bars, roller pins and lock pins for cracks, missing parts and damage. Replace damaged chain.

e. Installation.

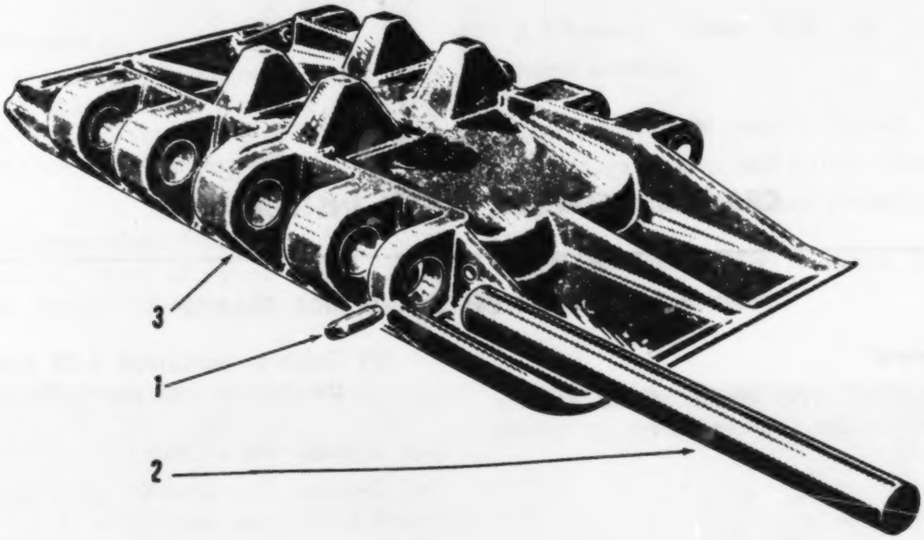
(1) Refer to paragraph 3-106 and install the crawler drive chains.

(2) Adjust the drive chains (para 3-21).

8-4. Crawler Drive Assembly

a. General. The crawler drive assemblies are located at the rear of and attached to the crawler side frames. They consist of chain and tread belt sprockets, bearings and shafts. The assemblies transmit power from the drive chains to the crawler belts.

b. Removal. Refer to figure 8-2 and remove the crawler drive assembly.



MEC 3810-287-15/ 8-1

1 Pin, keeper (2) 2 Pin, tread 3 Tread

Figure 8-1. Crawler belt assembly, exploded view.

c. *Disassembly.* Disassemble the crawler drive assembly in the numerical sequence as illustrated on figure 8-3.

d. *Cleaning.* Clean all parts with an approved cleaning solution.

e. *Inspection and Repair.*

(1) Inspect all parts for wear defects and damage. Replace worn, defective or damaged parts.

(2) Inspect the treads, sprockets, bearings and shafts for cracks, excessive wear and broken, damaged or missing parts. Repair or replace damaged or worn parts.

f. *Reassembly.* Reassemble the crawler drive assembly in reverse of the numerical sequence as illustrated on figure 8-3.

g. *Installation.*

(1) Refer to figure 8-2 and install the crawler drive assembly.

(2) Adjust the crawler belt assembly (para 3-22).

8-5. Front Idler Rollers

a. *General.* The idler rollers are mounted at the front of, and attached to, the crawler side frames. The rollers maintain alignment of the crawler belts and are adjusted to maintain proper belt tension.

b. *Removal.*

(1) Remove the crawler belts (para 8-105).

(2) Refer to figure 8-4 and remove the front idler rollers.

c. *Disassembly.* Disassemble the front idler rollers in the numerical sequence as illustrated on figure 8-5.

d. *Cleaning.* Clean all parts with an approved cleaning solution.

e. *Inspection and Repair.* Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

f. *Reassembly.* Reassemble the front idler rollers in reverse of the numerical sequence as illustrated on figure 8-5.

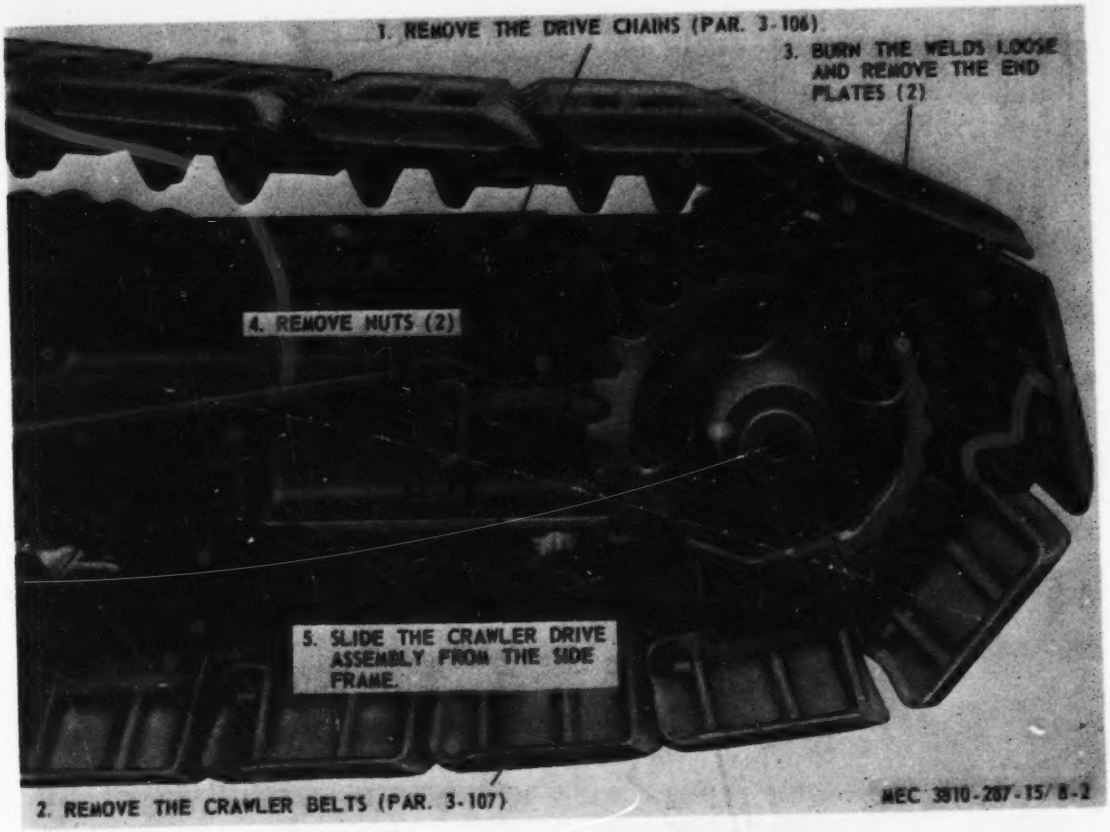

1. REMOVE THE DRIVE CHAINS (PAR. 3-106).
3. BURN THE WELDS LOOSE AND REMOVE THE END PLATES (2)
4. REMOVE NUTS (2)
5. SLIDE THE CRAWLER DRIVE ASSEMBLY FROM THE SIDE FRAME.
2. REMOVE THE CRAWLER BELTS (PAR. 3-107)
MEC 3810-287-15/8-2

Figure 8–2. Crawler drive assembly, removal and installation.

g. Installation.

(1) Refer to figure 8–4 and install the front idler rollers.

(2) Install the crawler belts (para 8–2).

8–6. Upper and Lower Rollers

a. General. The lower rollers are located between the crawler side frames and the crawler belt and attached to the underside of the side frames. They support the lower frame on the crawler belts. The upper rollers support the upper part of the belt on the side frames.

b. Removal.

(1) Remove the crawler belts (para 3–105).

(2) Refer to figure 8–6 and remove the rollers.

c. Disassembly. Disassemble the rollers in the numerical sequence as illustrated on figure 8–7.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

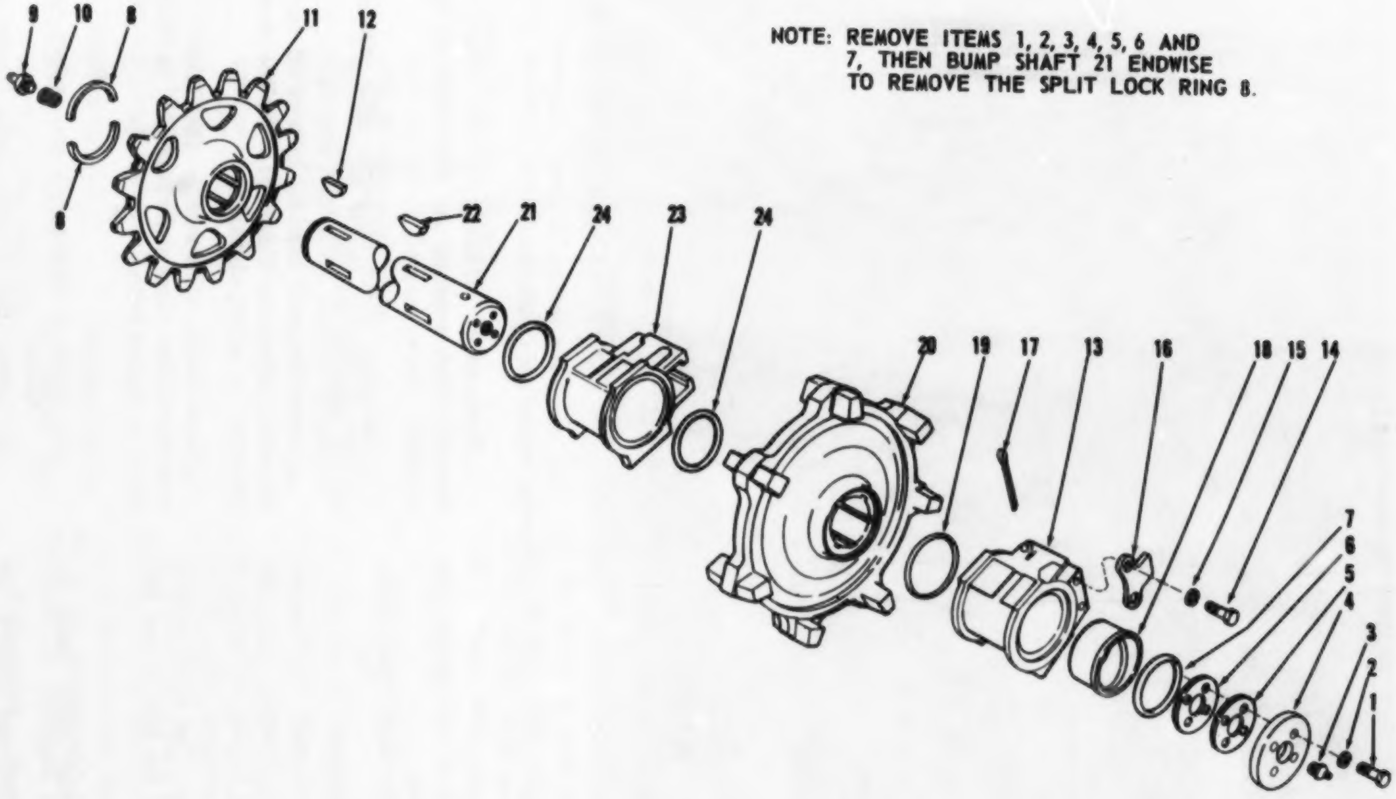
f. Reassembly. Reassemble the rollers in reverse of the numerical sequence as illustrated on figure 8–7.

g. Installation.

(1) Refer to figure 8–6 and install the rollers.

(2) Install the crawler belts (para 3–105).

NOTE: REMOVE ITEMS 1, 2, 3, 4, 5, 6 AND 7, THEN BUMP SHAFT 21 ENDWISE TO REMOVE THE SPLIT LOCK RING 8.



MEC 3810-287-15/8-3

1	Screw, cap (4)	7	Seal	13	Bearing closure	19	Seal
2	Washer, lock (4)	8	Lockring	14	Screw, cap (2)	20	Sprocket, crawler drive
3	Fitting, lubrication	9	Fitting, lubrication	15	Washer, lock (2)	21	Shaft
4	Plate, lock	10	Bushing	16	Lockplate	22	Key
5	Spacer	11	Sprocket, chain	17	Pin, cotter	23	Bearing closure
6	Spacer	12	Key	18	Bearing (4)	24	Seal

Figure 8-3. Crawler drive assembly, exploded view.

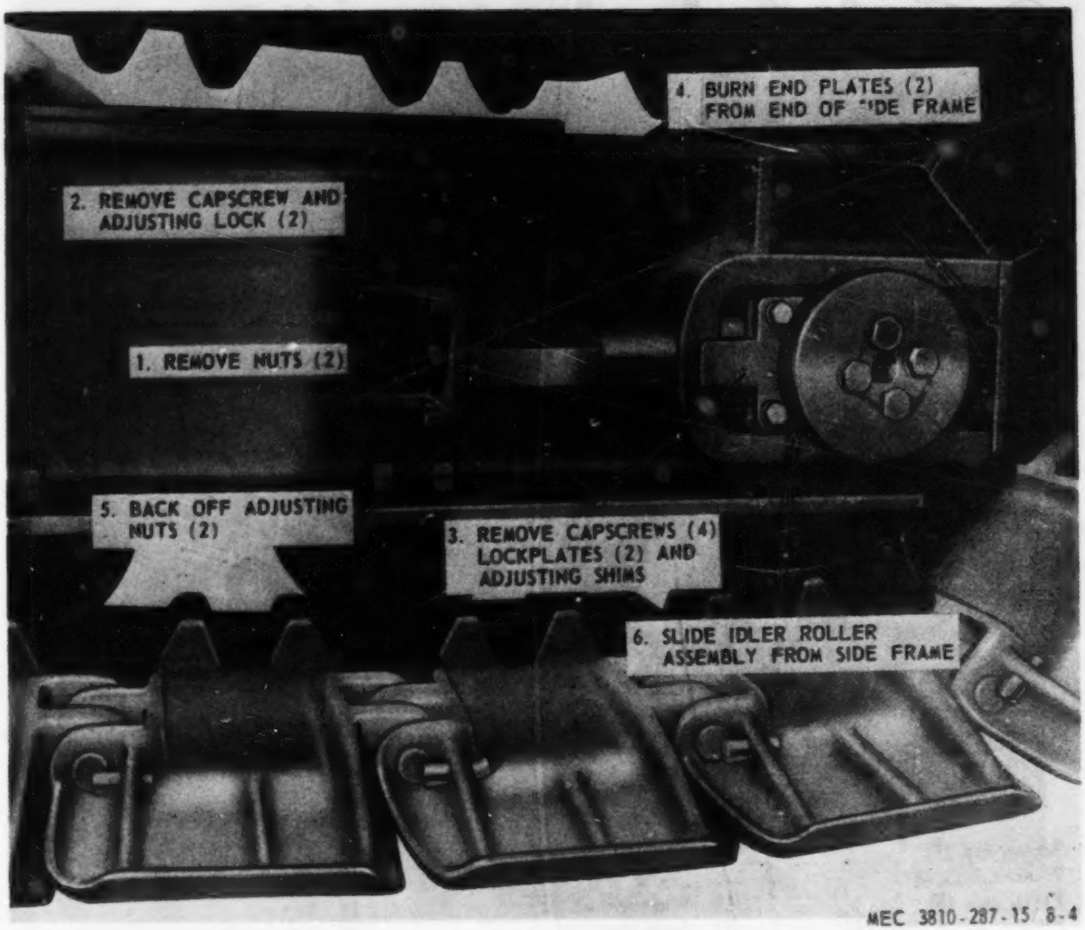
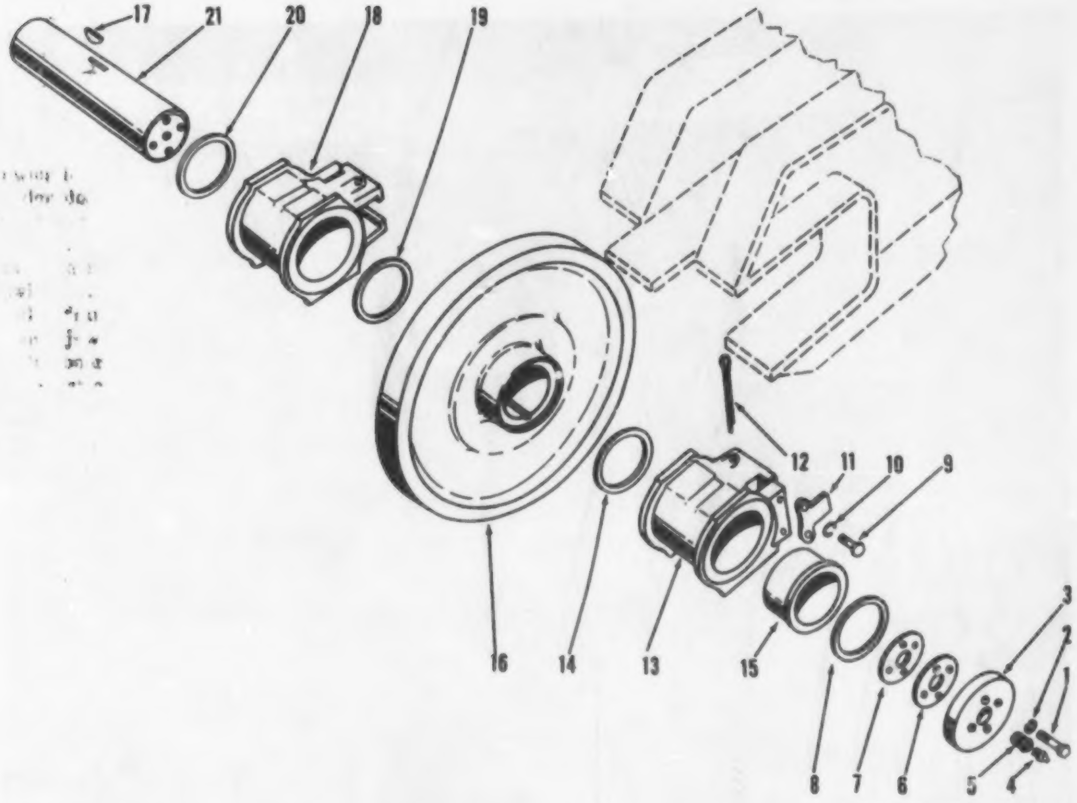

4. BURN END PLATES (2)
FROM END OF "IDE FRAME
2. REMOVE CAPSCREW AND
ADJUSTING LOCK (2)
1. REMOVE NUTS (2)
5. BACK OFF ADJUSTING
NUTS (2)
3. REMOVE CAPSCREWS (4)
LOCKPLATES (2) AND
ADJUSTING SHIMS
6. SLIDE IDLER ROLLER
ASSEMBLY FROM SIDE FRAME
MEC 3810-287-15 8-4

Figure 8-4. Front idler rollers, removal and installation.


17
21
20
18
19
12
11
10
9
16
14
13
15
3
2
1
8
7
6
5
4

MEC 3810-287-15/8-5

1	Screw, cap (8)	8	Seal	15	Bushing (4)
2	Washer, lock (8)	9	Screw, cap (4)	16	Roller
3	Plate, lock (2)	10	Washer, lock (4)	17	Key
4	Fitting, lubrication (2)	11	Lock plate (2)	18	Bearing closure
5	Bushing (2)	12	Pin, cotter (2)	19	Seal
6	Spacer (2)	13	Bearing closure	20	Seal
7	Spacer (2)	14	Seal	21	Shaft

Figure 8–5. Front idler rollers, exploded view.

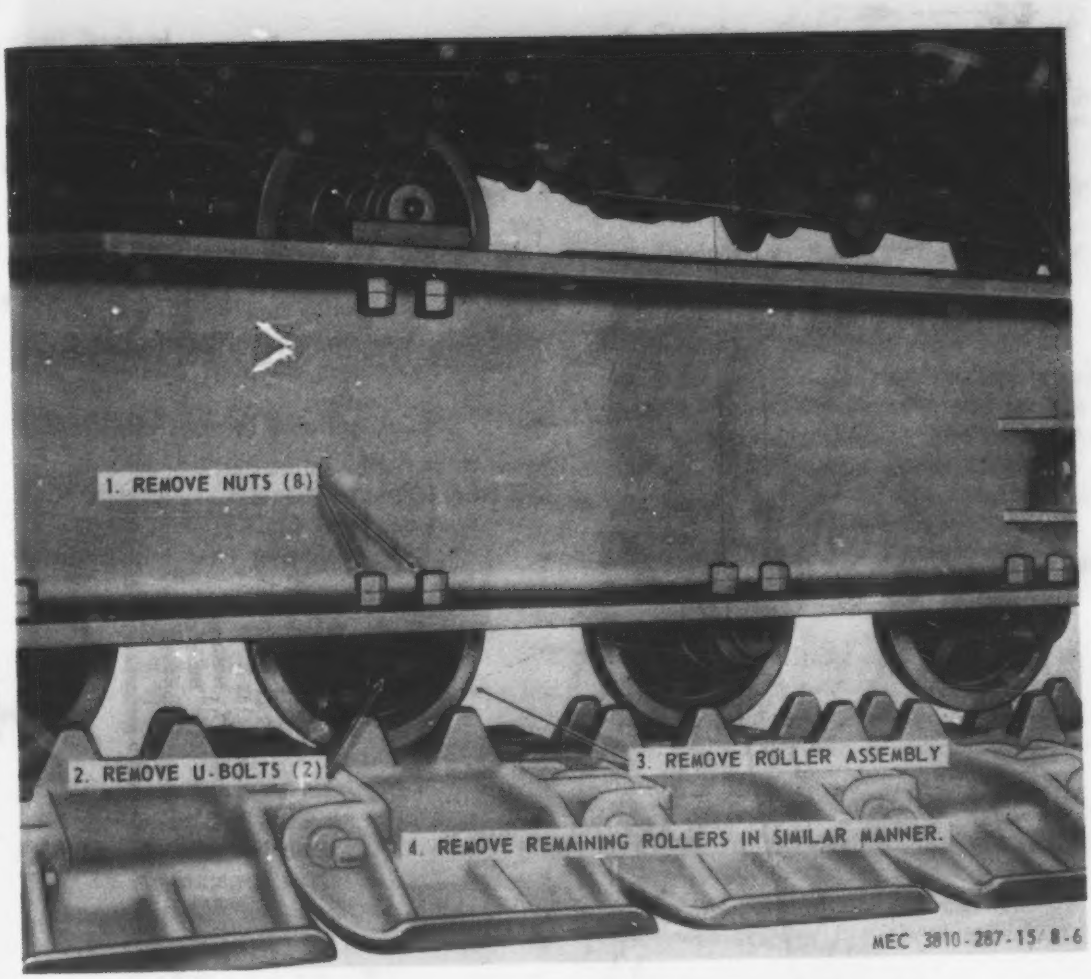
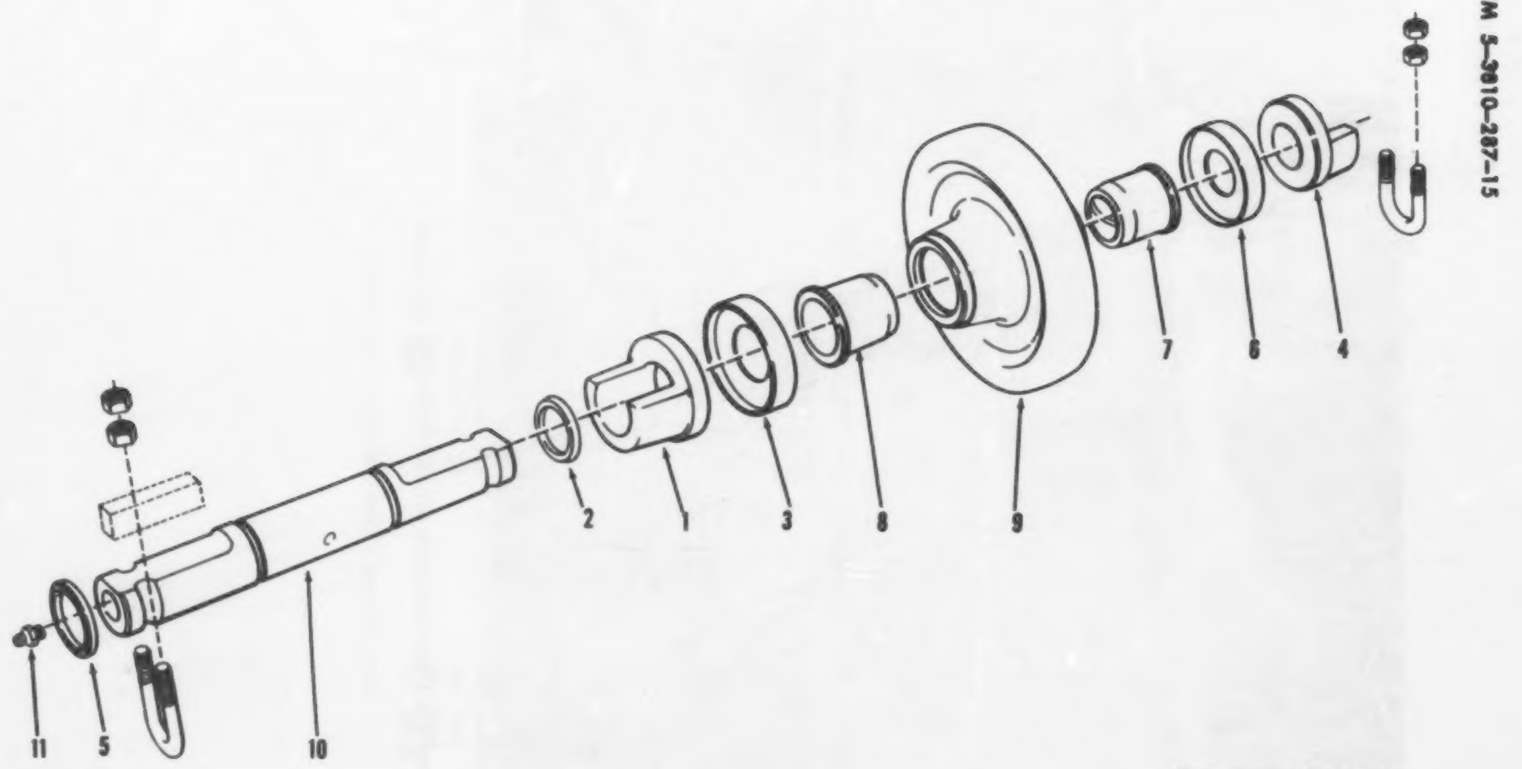

1. REMOVE NUTS (8)
2. REMOVE U-BOLTS (2)
3. REMOVE ROLLER ASSEMBLY
4. REMOVE REMAINING ROLLERS IN SIMILAR MANNER.
MEC 3810-287-15/8-6

Figure 8-6. Upper and lower rollers, removal and installation.



MEC 3810-287-15/ 8-7

1 Support
2 Seal, grease
3 Seal, dust
4 Support
5 Seal, grease
6 Seal, dust
7 Bushing
8 Bushing
9 Roller
10 Shaft
11 Fitting, lubrication

Figure 8-7. Upper and lower rollers, exploded view.

Section II. CRAWLER ASSEMBLY HYDRAULIC COMPONENTS

8-7. General

This section covers repair of the crawler hydraulic components, such as the main control bank, cylinders, lines and fittings. The main control valve bank for the crawler is located in the operator's compartment and connected through piping to the hydraulic pump and center rotating joint. From the rotating joint, the fluid is transferred to the operating cylinders through hose and piping. The hydraulic pump is located under the engine radiator and belt-driven from the crankshaft pulley.

8-8. Center Journal Rotating Joint

a. General. The center journal rotating joint is located in the vertical travel shaft and transfers hydraulic fluid from the superstructure to the crawler assembly.

b. Removal.

(1) Remove the hoist shaft assembly (para 5-31).

(2) Refer to figure 8-8 and remove the rotating joint.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

e. Installation.

(1) Refer to figure 8-8 and install the rotating joint assembly.

(2) Install the hoist shaft assembly (para 5-31).

8-9. Crawler Operating Levers and Linkage

a. General. The crawler operating levers and linkage are located in the crawler carbody and accessible through the bottom cover plates. The levers and linkage actuate the jaw clutches for steering and locking the crawler assembly.

b. Removal. Refer to figure 8-9 and remove the operating levers and linkage.

c. Disassembly. Disassembly is accomplished concurrently with removal.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

f. Reassembly. Reassembly is accomplished concurrently with installation.

g. Installation. Refer to figure 8-9 and install the operating levers and linkage.

8-10. Crawler Jaw Clutch Cylinders

a. General. The jaw clutch cylinders are located in the crawler carbody and actuate the jaw clutches in response to the control valve bank in the operator's compartment.

b. Removal. Refer to figure 8-10 and remove the jaw clutch cylinders.

c. Disassembly. Disassemble the cylinders in the numerical sequence as illustrated on figure 8-11.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

f. Reassembly. Reassemble the jaw clutch cylinders in reverse of the numerical sequence as illustrated on figure 8-11.

g. Installation. Refer to figure 8-10 and install the crawler jaw clutch cylinders.

8-11. Crawler Control Valve

a. General. The crawler control valve is located in the operator's compartment and mounted on the right hand panel. It is connected between the hydraulic pump and the center journal rotating joint and controls the flow of oil to the crawler operating cylinders.

b. Removal. Remove the control valve (para 3-95).

c. Disassembly. Disassemble the control valve in the numerical sequence as illustrated on figure 8-12.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

f. Reassembly. Reassemble the crawler control valve in reverse of the numerical sequence as illustrated on figure 8-12.

g. Installation. Install the control valve (para 3-95).

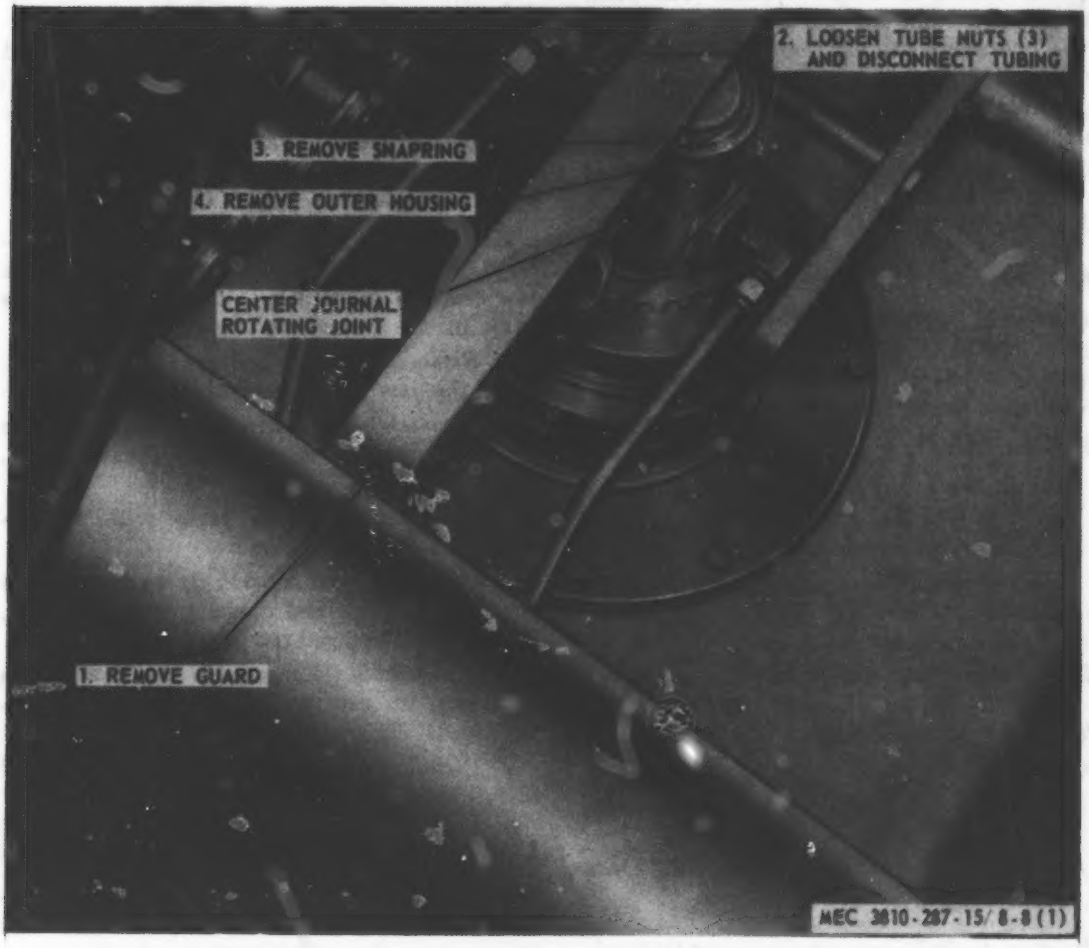

2. LOOSEN TUBE NUTS (3) AND DISCONNECT TUBING
3. REMOVE SNAPRING
4. REMOVE OUTER HOUSING
CENTER JOURNAL ROTATING JOINT
1. REMOVE GUARD
MEC 3810-287-15/8-8 (1)

Figure 8-8 (1). Center journal rotating joint, removal and installation.

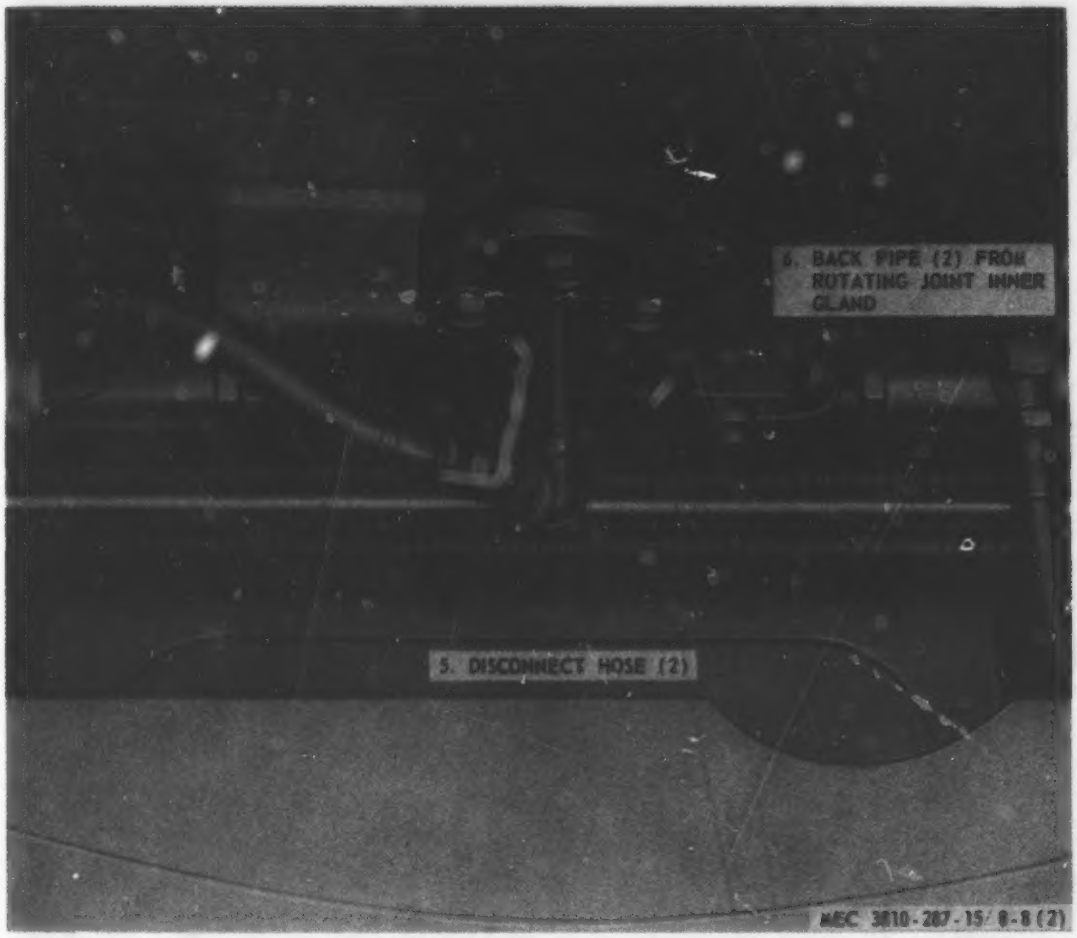

6. BACK PIPE (2) FROM ROTATING JOINT INNER GLAND
5. DISCONNECT HOSE (2)
MEC 3810-287-15/8-8 (2)

Figure 8-8 (2).—Continued.

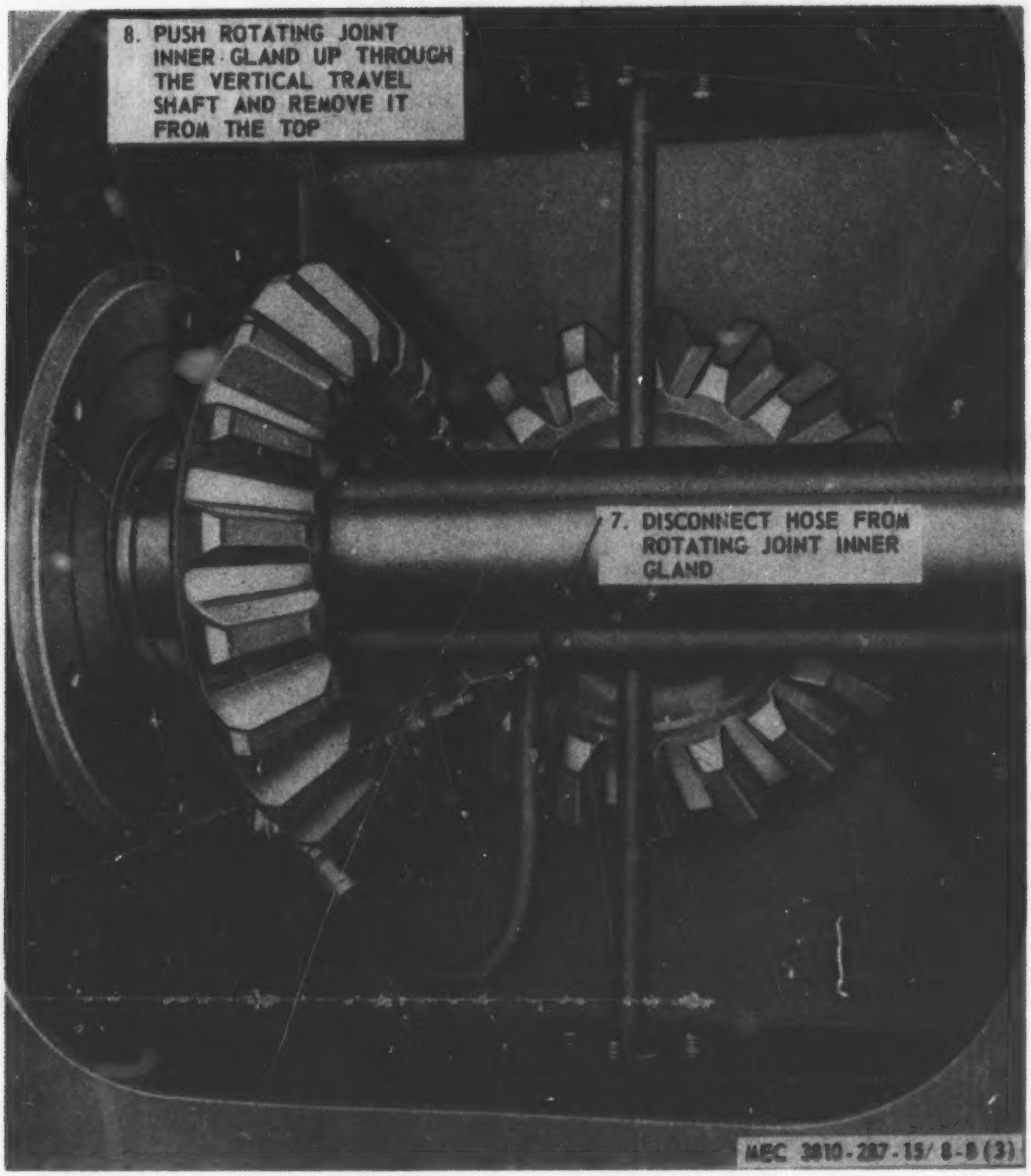
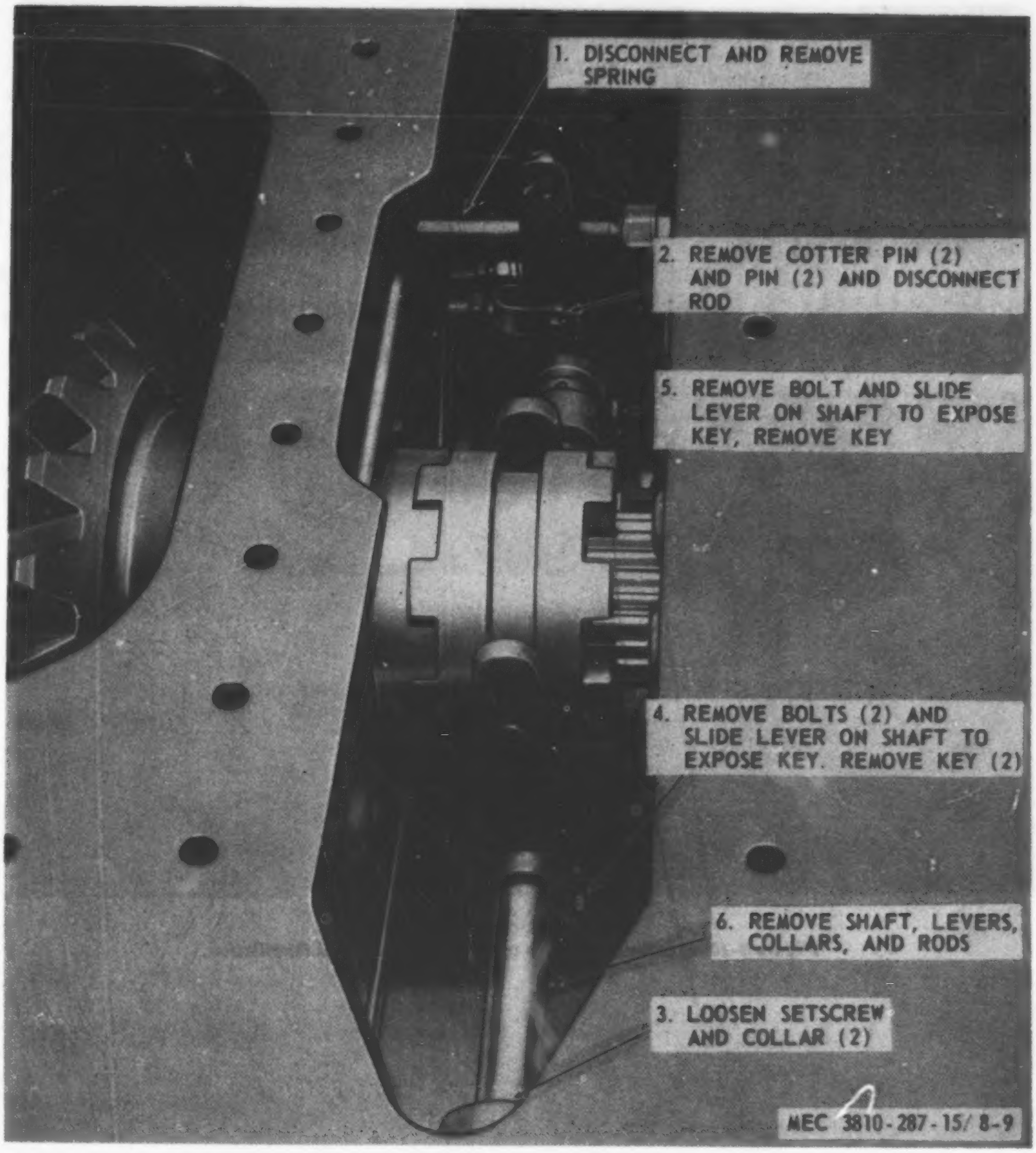

8. PUSH ROTATING JOINT INNER GLAND UP THROUGH THE VERTICAL TRAVEL SHAFT AND REMOVE IT FROM THE TOP
7. DISCONNECT HOSE FROM ROTATING JOINT INNER GLAND
MEC 3810-287-15/8-8(3)

Figure 8-8 (3).—Continued.



1. DISCONNECT AND REMOVE SPRING

2. REMOVE COTTER PIN (2) AND PIN (2) AND DISCONNECT ROD

5. REMOVE BOLT AND SLIDE LEVER ON SHAFT TO EXPOSE KEY, REMOVE KEY

4. REMOVE BOLTS (2) AND SLIDE LEVER ON SHAFT TO EXPOSE KEY. REMOVE KEY (2)

6. REMOVE SHAFT, LEVERS, COLLARS, AND RODS

3. LOOSEN SETSCREW AND COLLAR (2)

Figure 8-9. Crawler operating levers and linkage, removal and installation.

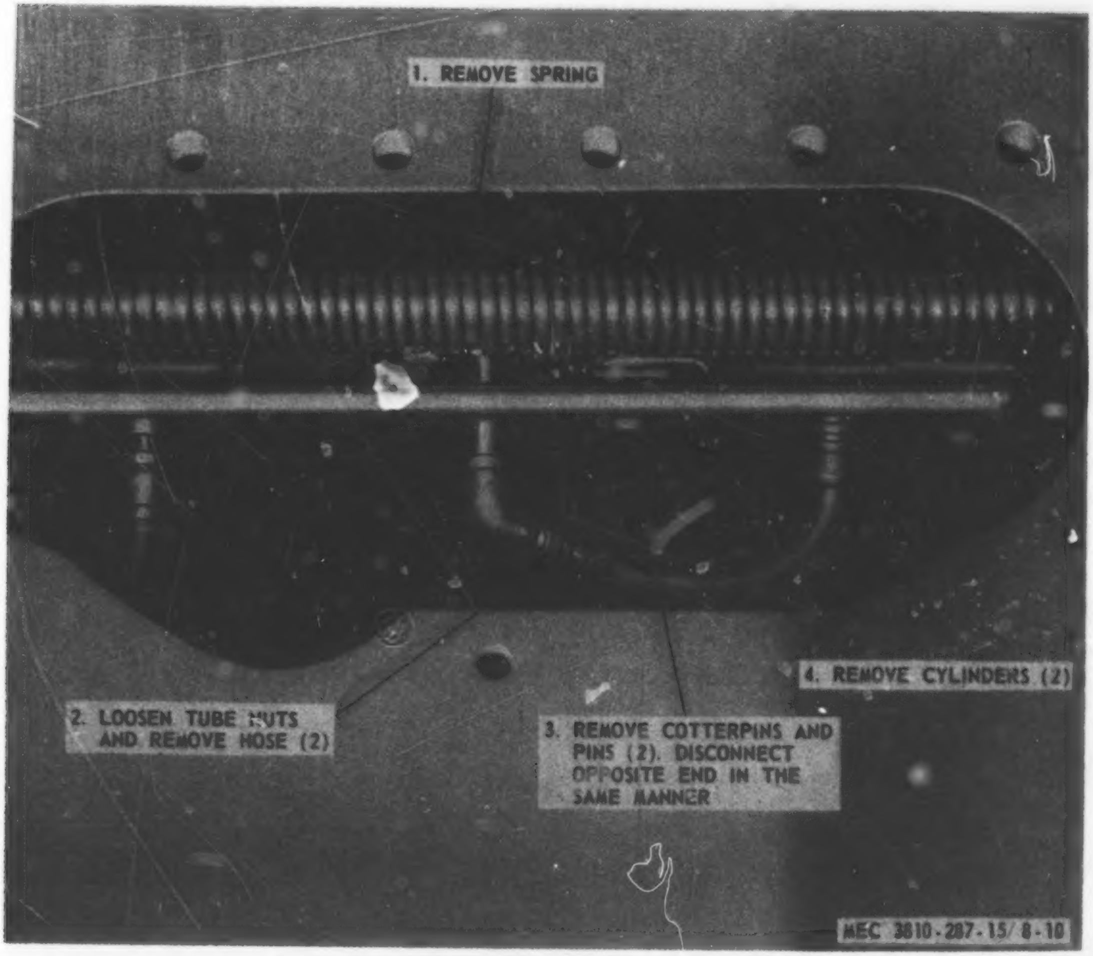
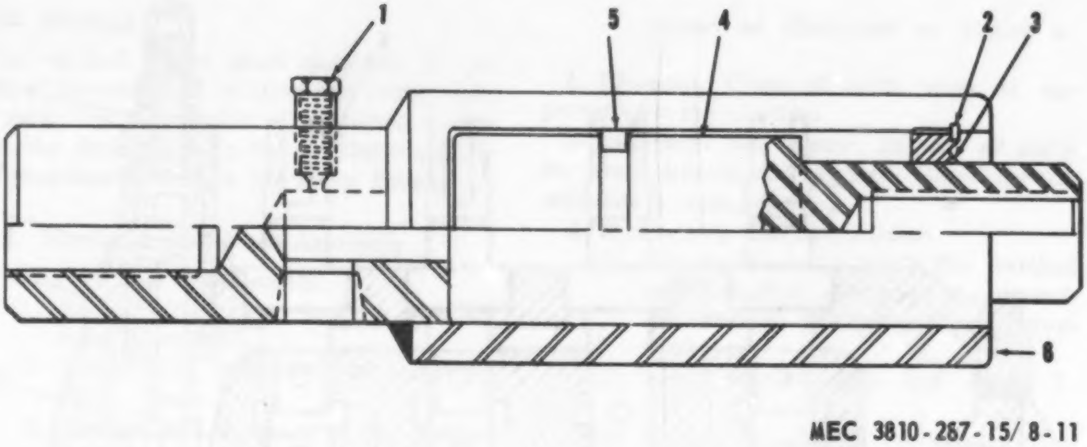
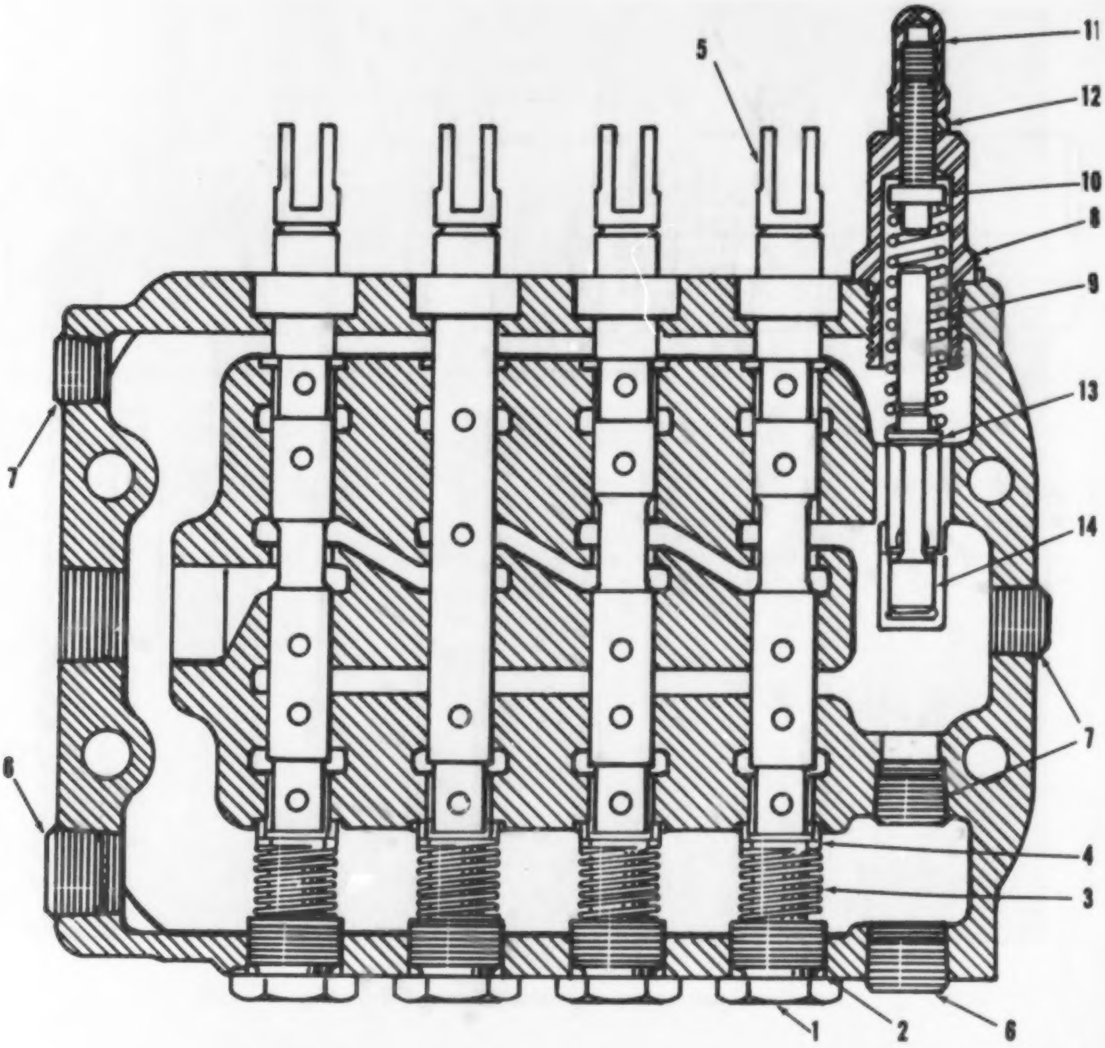

1. REMOVE SPRING
2. LOOSEN TUBE NUTS AND REMOVE HOSE (2)
3. REMOVE COTTERPINS AND PINS (2). DISCONNECT OPPOSITE END IN THE SAME MANNER
4. REMOVE CYLINDERS (2)
MEC 3810-287-15/8-10

Figure 8-10. Crawler jaw clutch cylinders, removal and installation.


1
5
4
2
3
6
MEC 3810-287-15/8-11

1 Plug
2 Retainer
3 Packing
4 Piston
5 Ring, piston
6 Body

Figure 8-11. Crawler jaw clutch cylinder, exploded view.


5
11
12
10
8
9
13
14
7
7
7
8
4
3
1
2
6

MEC 3810-287-15/8-12

1 Cap (4)
2 Ring, O- (4)
3 Spring (4)
4 Seal (4)
5 Plunger (4)
6 Plug, pipe (2)
7 Plug, pipe (3)
8 Cap
9 Spring
10 Guide, spring
11 Nut
12 Nut, lock
13 Plunger
14 Seat

Figure 8–12. Crawler control valve, cross-sectional view.

Section III. VERTICAL TRAVEL SHAFT ASSEMBLY

8-12. General

The vertical travel shaft assembly is located at the center of rotation and mounted in the lower frame assembly. It transmits power from the deck gears, in the turntable bed, to the cross-travel shaft in the lower frame.

8-13. Vertical Travel Shaft Assembly

a. Removal and Disassembly.

(1) Remove the center journal rotating joint (para 8-8).

(2) Remove the turntable bed (para 5-35).

(3) Remove and disassemble the vertical travel shaft in the numerical sequence as illustrated on figure 8-13.

b. Cleaning. Clean all parts with an approved cleaning solution.

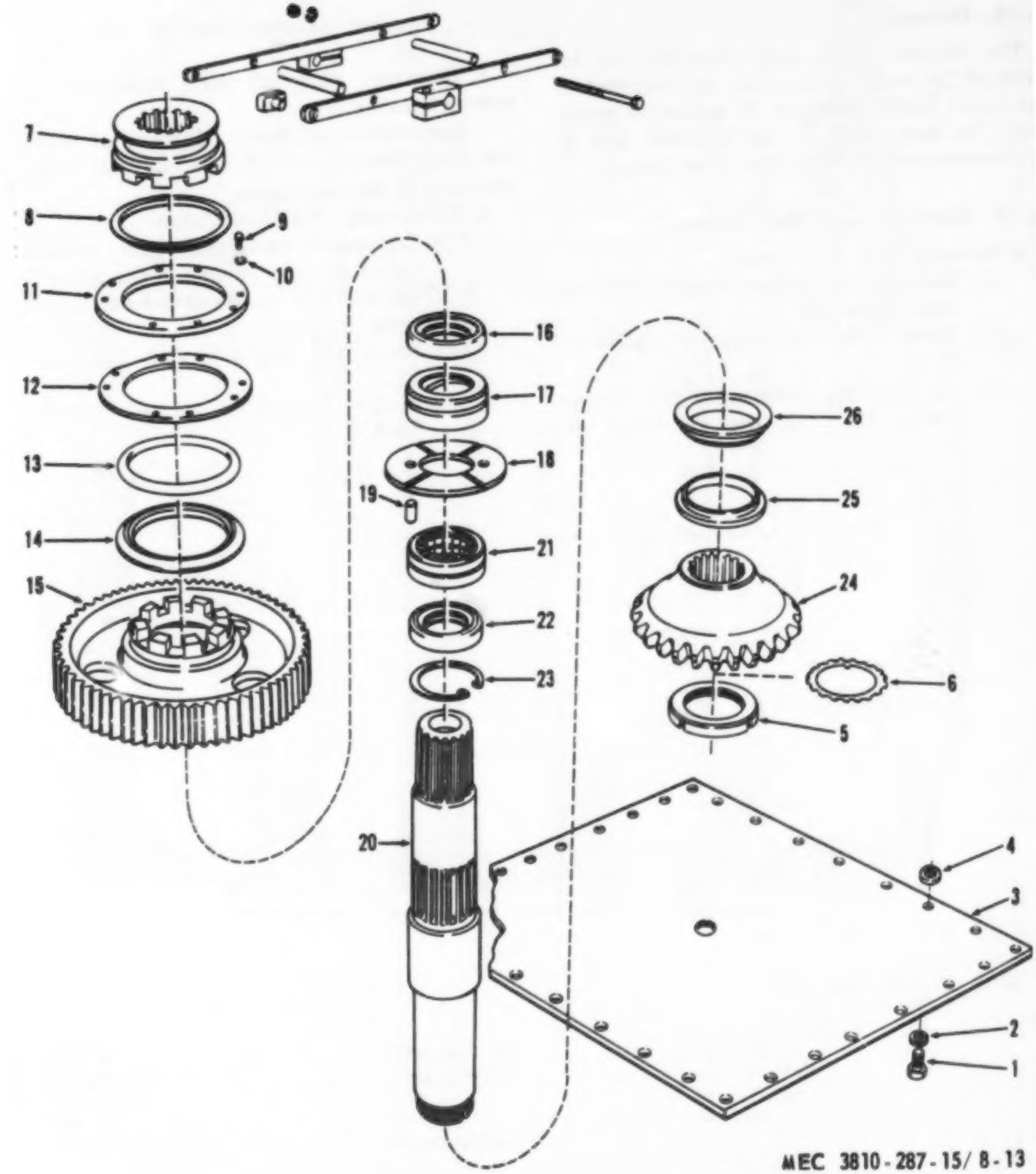
c. Inspection and Repair. Inspect all parts for wear, defects, and damage. Replace worn, defective or damaged parts.

d. Reassembly and Installation.

(1) Reassemble and install the vertical travel shaft in reverse of the numerical sequence as illustrated on figure 8-13.

(2) Install the turntable bed (para 5-35).

(3) Install the center journal rotating joint (para 8-8).


7
8
9
10
11
12
13
14
15
16
17
18
19
21
22
23
20
26
25
24
6
5
4
3
2
1
MEC 3810-287-15/ 8-13

1 Screw, cap (80)
2 Washer, lock (80)
3 Plate, cover
4 Gasket (80)
5 Nut, spanner
6 Washer, lock
7 Clutch, jaw
8 Washer, thrust
9 Screw, cap (8)

Figure 8-13. Vertical travel shaft assembly, exploded view.

10 Washer, lock (8)
11 Plate, retainer
12 Plate, retainer
13 Seal
14 Seal
15 Gear
16 Seal, grease
17 Bushing
18 Washer, thrust
19 Dowel (2)
20 Shaft
21 Bearing
22 Seal, grease
23 Ring, snap
24 Gear, bevel
25 Retainer
26 Retainer

Figure 8-13—Continued

Section IV. HORIZONTAL TRAVEL SHAFT ASSEMBLY

8–14. General

The horizontal travel shaft is located in the crawler frame assembly and transmits power from the vertical travel shaft to the crawler drive chains. It consists primarily of shafts, jaw clutches, a bevel gear, and bearings.

8–15. Outer Shafts and Sprockets

a. General. The outer travel shafts extend through the crawler carbody and transmit power from the center travel shaft and pinion gear to the crawler drive chains. Hydraulically controlled sliding jaw clutches provide the mechanical connection between the inner and outer shafts.

b. Removal and Disassembly.

(1) Refer to paragraph 8–3 and remove the crawler drive chains.

(2) Refer to figure 8–14 and remove and disassemble the outer shaft and sprocket. Remove and disassemble the opposite shaft in a similar manner.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

e. Reassembly and Installation.

(1) Reassemble the outer shaft and sprocket in reverse of the numerical sequence as illustrated on figure 8–14.

(2) Refer to paragraph 8–3 and install the crawler drive chains.

8–16. Center Travel Shaft and Bevel Gear Assembly

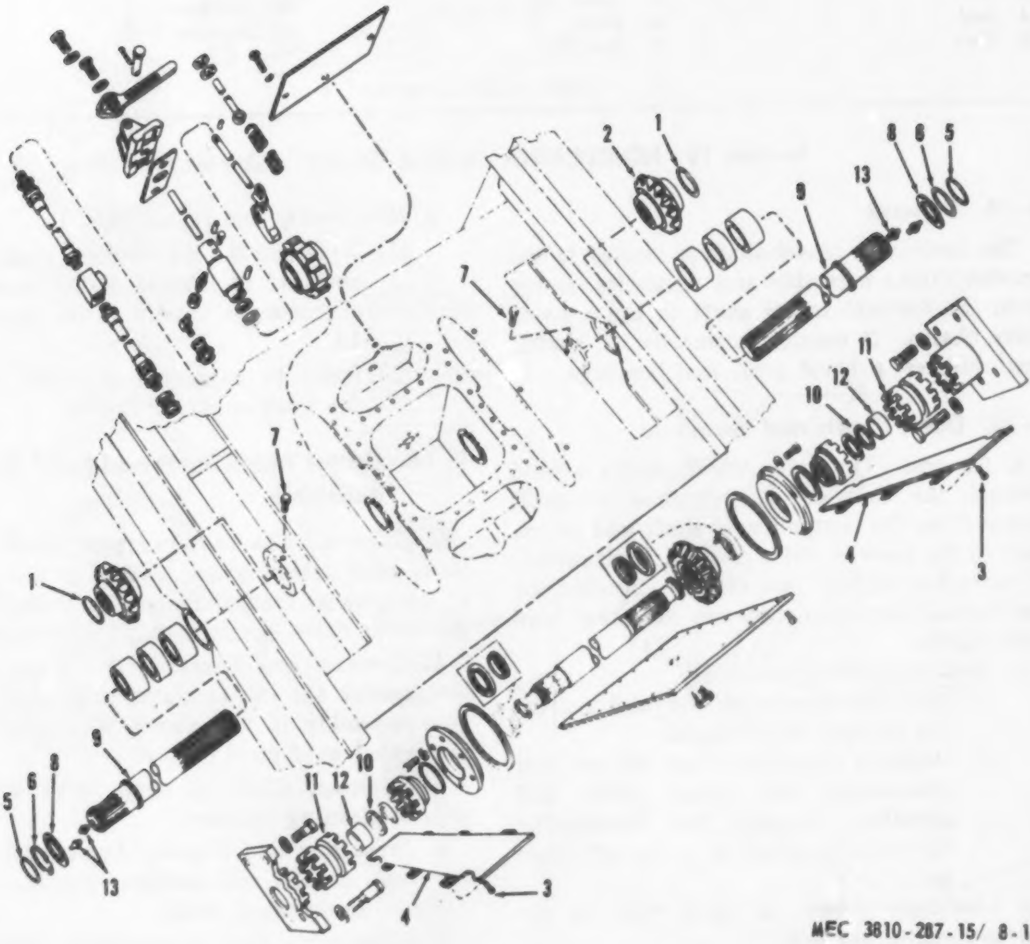
a. General. The center travel shaft and bevel gear assembly are located in the center of the crawler frame. Power is transmitted to the outer drive shafts through jaw clutches.

b. Removal and Disassembly. Remove and disassemble the center travel shaft and bevel gear assembly in the numerical sequence as illustrated on figure 8–15.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

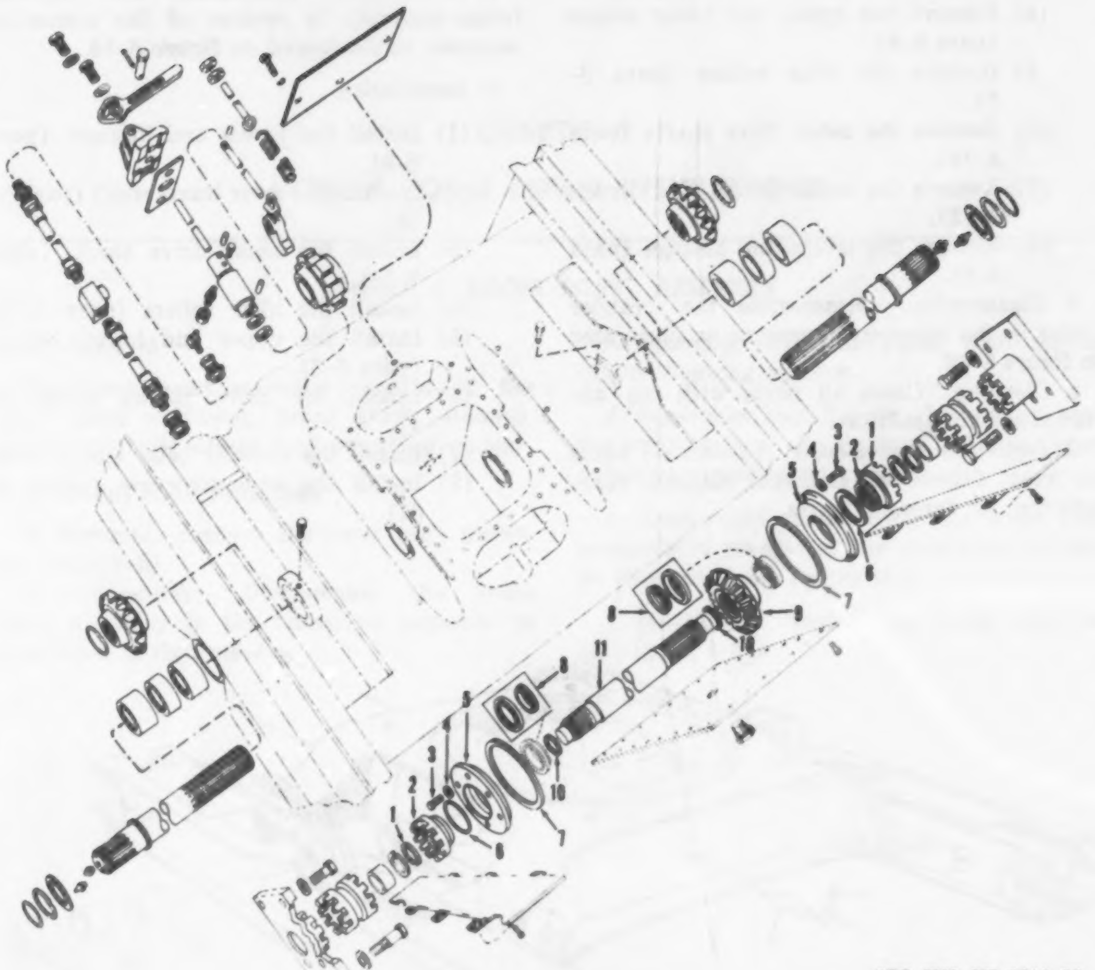
e. Reassembly and Installation. Reassemble and install the center travel shaft and bevel gear assembly in reverse of the numerical sequence as illustrated on figure 8–15.


2
1
8
6
5
13
9
7
11
12
10
7
1
4
3
14
9
8
6
5
13
11
12
10
4
3

MEC 3810-287-15/ 8-14

1 Ring, retaining (2)
2 Sprocket (2)
3 Screw, cap (12)
4 Plate, cover (2)
5 Ring, retaining (2)
6 Ring, retaining (2)
7 Screw, set (4)
8 Retainer, shaft (2)
9 Shaft, outer drive (2)
10 Ring, retaining (2)
11 Clutch, jaw (2)
12 Bushing (2)
13 Fittings (4)

Figure 8-14. Outer shaft and sprocket, exploded view.



MEC 3810-287-15/8-15

1	Retainer (2)
2	Jaw (2)
3	Screw, cap (12)
4	Washer, lock (12)
5	Retainer, bearing (2)
6	O-ring
7	Gasket (2)
8	Bearing
9	Gear, bevel
10	Retainer (2)
11	Shaft, center drive

Figure 8-15. Center travel shaft and bevel gear assembly, exploded view.

Section V. CRAWLER FRAME

8-17. General

The crawler frame assembly is the lowermost component of the machine and contains the propelling mechanism, steering mechanism and the crawler belts.

8-18. Crawler Frame

a. Removal.

(1) Remove the superstructure (para 5-31).

(2) Remove the crawler belts (para 8-2).

(3) Remove the drive rollers (para 8-4).

(4) Remove the upper and lower rollers (para 8-6).

(5) Remove the idler rollers (para 8-5).

(6) Remove the outer drive shafts (para 8-14).

(7) Remove the center travel shaft (para 8-15).

(8) Remove the levers and linkage (para 8-9).

b. Disassembly. Disassemble the crawler frame in the numerical sequence as illustrated on figure 8-16.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

e. Reassembly. Reassemble the crawl frame assembly in reverse of the numeric sequence as illustrated on figure 8-16.

f. Installation.

(1) Install the levers and linkage (par 8-9).

(2) Install the center travel shaft (para 8 15).

(3) Install the outer drive shaft (par 8-14).

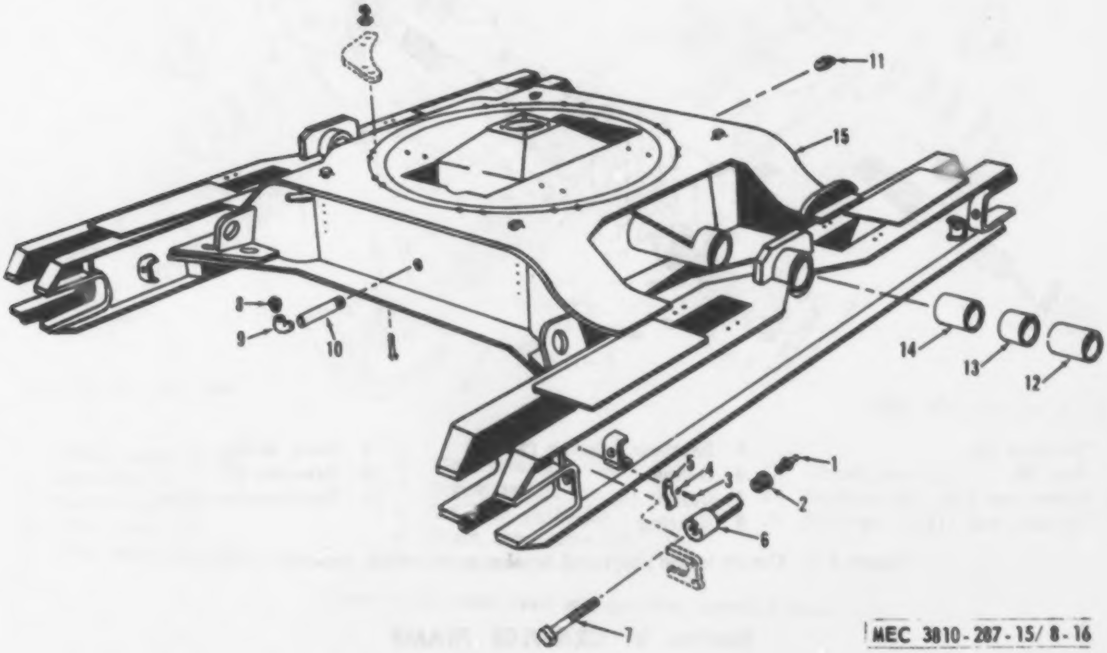
(4) Install the idler rollers (para 8-5)

(5) Install the upper and lower roller (para 8-6).

(6) Install the drive rollers (para 8-4).

(7) Install the crawler belts (para 8-2).

(8) Install the superstructure (para 5-31).



1 Fitting, lubrication
2 Bushing
3 Screw, cap (4)
4 Washer, lock (4)
5 Retainer (4)
6 Nut, adjusting
7 Bolt, adjusting
8 Plug
9 Elbow
10 Pipe
11 Plug
12 Bushing, outer (2)
13 Spacer (2)
14 Bushing, inner (2)
15 Crawler frame

Figure 8-16. Crawler frame assembly, exploded view.

CHAPTER 9

CRANE BOOM REPAIR INSTRUCTIONS

Section I. BOOM POINT ASSEMBLY

9–1. General

The boom point assembly consists of the boom point weldment, point shaft, sheaves, guards and pile driver lead attaching plates.

9–2. Boom Point Assembly

a. Removal. Remove the boom peak assembly (para 2–5).

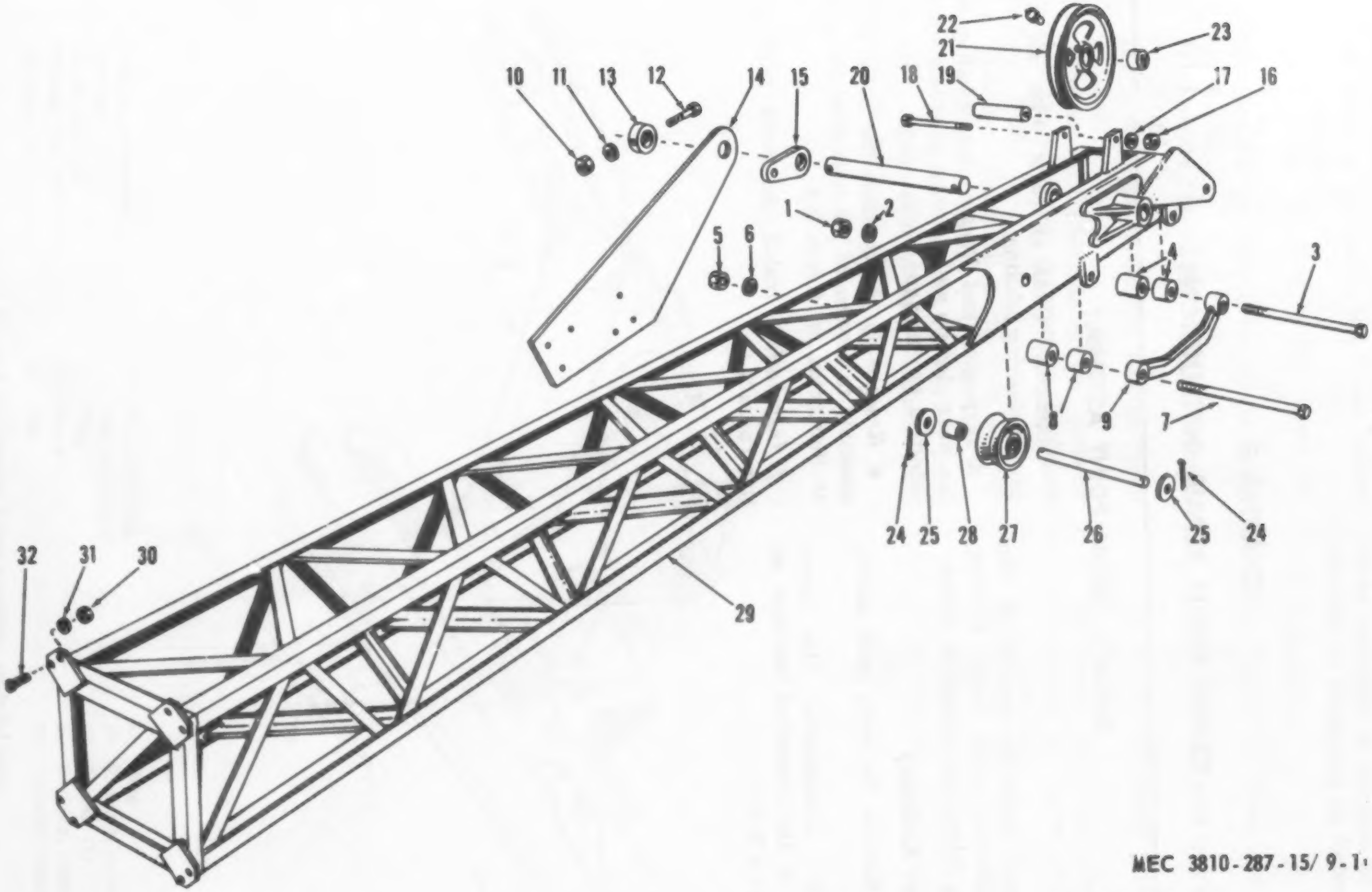
b. Disassembly. Disassemble the boom point assembly in the numerical sequence as illustrated in figure 9–1.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

e. Reassembly. Reassemble the boom point assembly in reverse of the numerical sequence as illustrated on figure 9–1.

f. Installation. Install the boom peak section (para 2–5).


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32

MEC 3810-287-15/9-1

1	Nut	5	Nut	9	Guard, cable (4)	13	Collar (2)
2	Washer, lock	6	Washer, lock	10	Nut	14	Adapter, pile driver (2)
3	Bolt	7	Bolt	11	Washer, lock	15	Link (2)
4	Spacer (2)	8	Spacer (2)	12	Bolt	16	Nut

Figure 9-1. Crane boom peak section, exploded view.

17	Washer, lock
18	Bolt
19	Spacer
20	Shaft
21	Sheave (3)
22	Fitting, lubrication (4)
23	Bushing (4)
24	Pin, cotter
25	Washer
26	Shaft
27	Roller (3)
28	Bushing (3)
29	Boom peak weldment
30	Nut (8)
31	Washer, lock (8)
32	Bolt (8)

Figure 9-1—Continued.

Section II. BOOM BASE ASSEMBLY

9-3. General

The boom base assembly consists of the boom base weldment, bushings and attaching pins and hardware. The boom base is the lower most assembly in the boom and attaches directly to the turntable bed.

9-4. Boom Base Assembly

a. Removal.

(1) Remove the crane boom (para 2-5).

(2) Remove the boom base section (para 2-5).

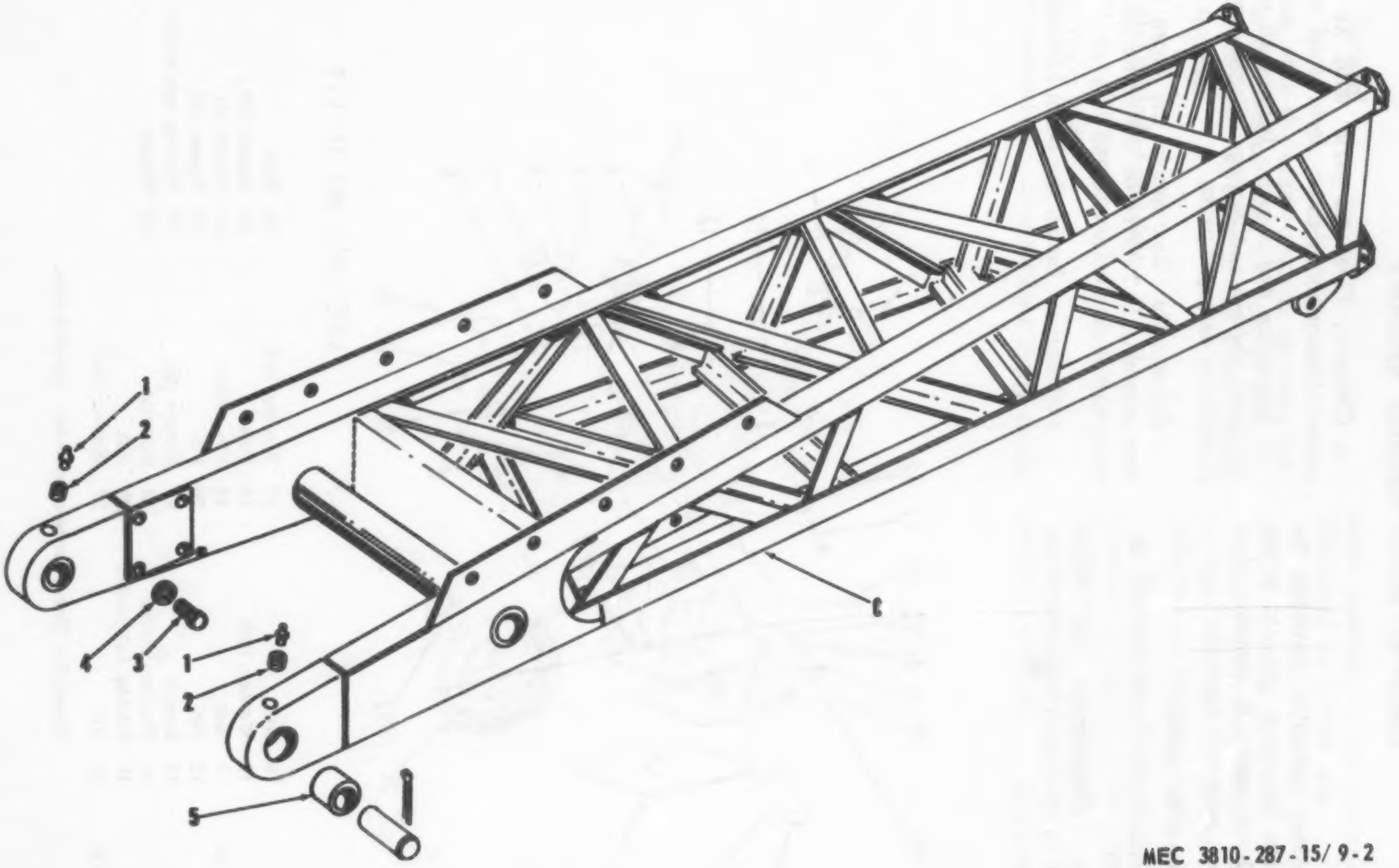
b. Disassembly. Disassemble the boom base assembly in the numerical sequence as illustrated on figure 9-2.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

e. Reassembly. Reassemble the boom base assembly in reverse of the numerical sequence as illustrated on figure 9-2.

f. Installation. Install the boom base section (para 2-5).



MEC 3810-287-15/9-2

1 Fitting, lubrication
2 Bushing
3 Screw, cap
4 Washer, lock
5 Bushing
6 Boom base weldment

Figure 9-2. Boom base section, exploded view.

Section III. BOOM HARNESS ASSEMBLY

9–5. General

The boom harness assembly provides the connection between the boom pendant cables and the boom hoist cable. It consists of a weldment, sheaves, pins and bushings.

9–6. Boom Harness Assembly

a. Removal. Remove the boom harness assembly (para 2–6).

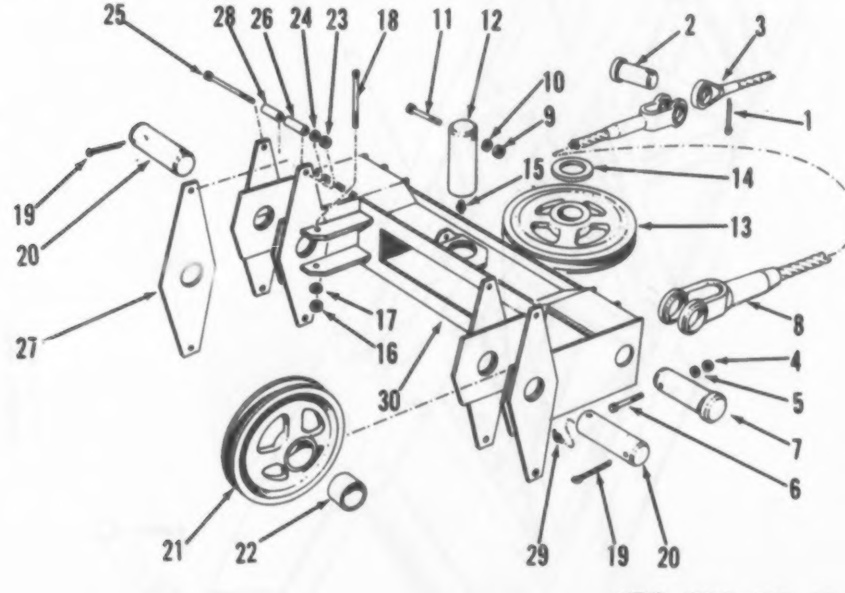
b. Disassembly. Disassemble the boom harness assembly in the numerical sequence as illustrated on figure 9–3.

c. Cleaning. Clean all parts with an proved cleaning solution.

d. Inspection and Repair. Inspect all p for wear, defects and damage. Replace w defective or damaged parts.

e. Reassembly. Reassemble the boom ness assembly in reverse of the numerical quence as illustrated on figure 9–3.

f. Installation. Install the boom harness sembly (para 2–6).



MEC 3810-287-15/ 9-3

1	Pin, cotter	9	Nut	17	Washer, lock	25	Bolt
2	Pin (2)	10	Washer, lock	18	Bolt	26	Spacer (2)
3	Cable, pendant (2)	11	Bolt	19	Pin, cotter	27	Guard (2)
4	Nut	12	Pin	20	Pin	28	Spacer (2)
5	Washer, lock	13	Sheave	21	Sheave (4)	29	Fitting, lubrication
6	Bolt	14	Washer, thrust	22	Bushing	30	Frame
7	Pin	15	Fitting, lubrication	23	Nut		
8	Cable, pendant (2)	16	Nut	24	Washer, lock		

Figure 9–3. Boom harness assembly, exploded view.

Section IV. HOOK BLOCK ASSEMBLY

9-7. General

The hook block assembly is used in conjunction with the crane boom to increase the number of parts of cable for heavier lifts. It is attached and reeved with the crane boom and hoist cable.

9-8. Hook Block Assembly

a. Removal. Remove the hook block assembly (para 2-5).

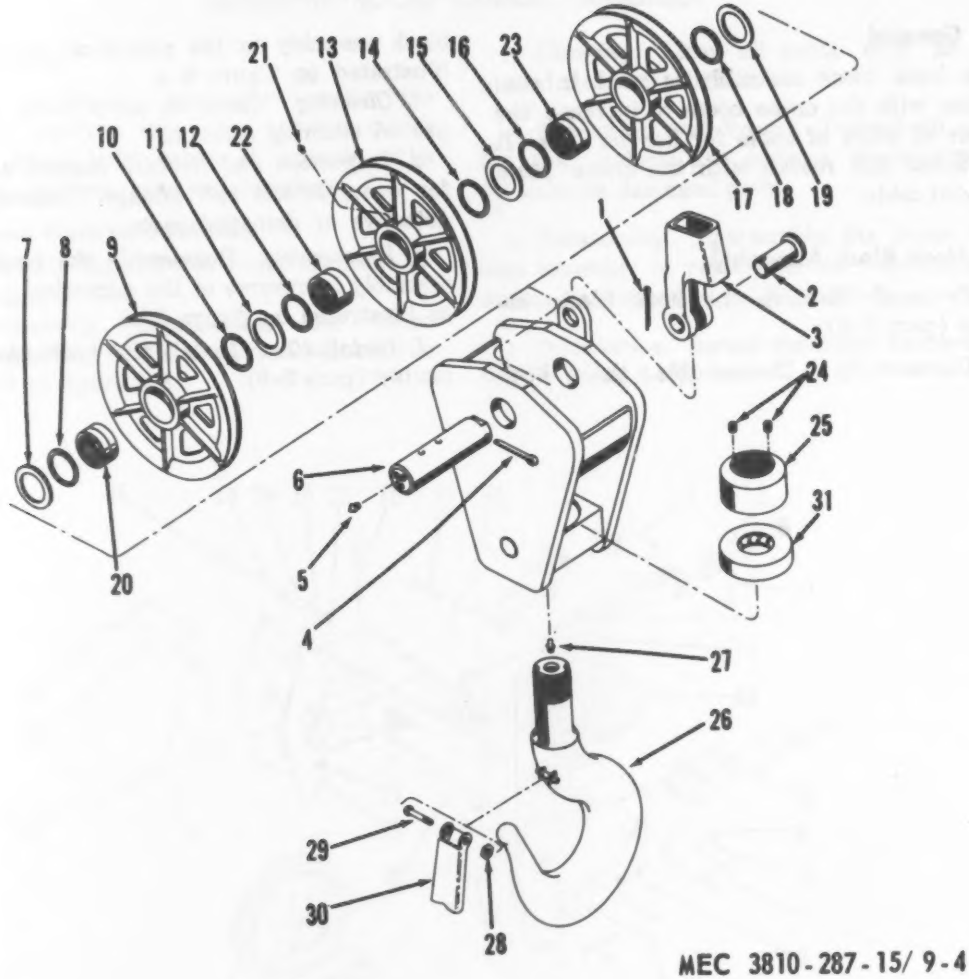
b. Disassembly. Disassemble the hook block assembly in the numerical sequence as illustrated on figure 9-4.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

e. Reassembly. Reassemble the hook block assembly in reverse of the numerical sequence as illustrated on figure 9-4.

f. Installation. Install the hook block assembly (para 2-5).


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
MEC 3810-287-15/9-4

1	Pin, cotter
2	Pin
3	Socket, cable
4	Pin, cotter
5	Fitting, lubrication
6	Pin
7	Washer
8	Washer
9	Sheave
10	Washer
11	Washer
12	Washer
13	Sheave
14	Washer
15	Washer
16	Washer
17	Sheave
18	Washer
19	Washer
20	Bearing
21	Fitting, lubrication (3)
22	Bearing
23	Bearing
24	Plug, dowel (2)
25	Nut, special
26	Hook
27	Fitting, lubrication
28	Nut
29	Bolt
30	Safety latch

Figure 9-4. Hook block assembly, exploded view.

CHAPTER 10

BACKHOE ATTACHMENT REPAIR INSTRUCTIONS

Section I. BUCKET ASSEMBLY

10-1. General

This section covers repair instructions on the bucket assembly. This assembly consists of the bucket, bucket teeth, side cutters, attaching pins and bushings and the padlock sheave assembly.

10-2. Backhoe Bucket Assembly

a. General. The backhoe bucket assembly is attached to the handle and pitch brace assembly and actuated by the pull cables through the padlock sheave assembly.

b. Removal. Refer to figure 10-1 and remove the back hoe bucket assembly.

c. Disassembly. Disassemble the backhoe bucket assembly in the numerical sequence as illustrated on figure 10-2.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.
(2) Inspect the teeth and side cutters for wear and damage. Repair or replace worn or damaged parts.
(3) Inspect the padlock assembly for worn or damaged links, broken pins and missing parts. Inspect the sheave and bushing for wear and damage. Repair or replace all worn or damaged parts.

f. Reassembly. Reassemble the backhoe bucket assembly in reverse of the numerical sequence as illustrated on figure 10-2.

g. Installation. Refer to figure 10-1 and install the backhoe bucket assembly.

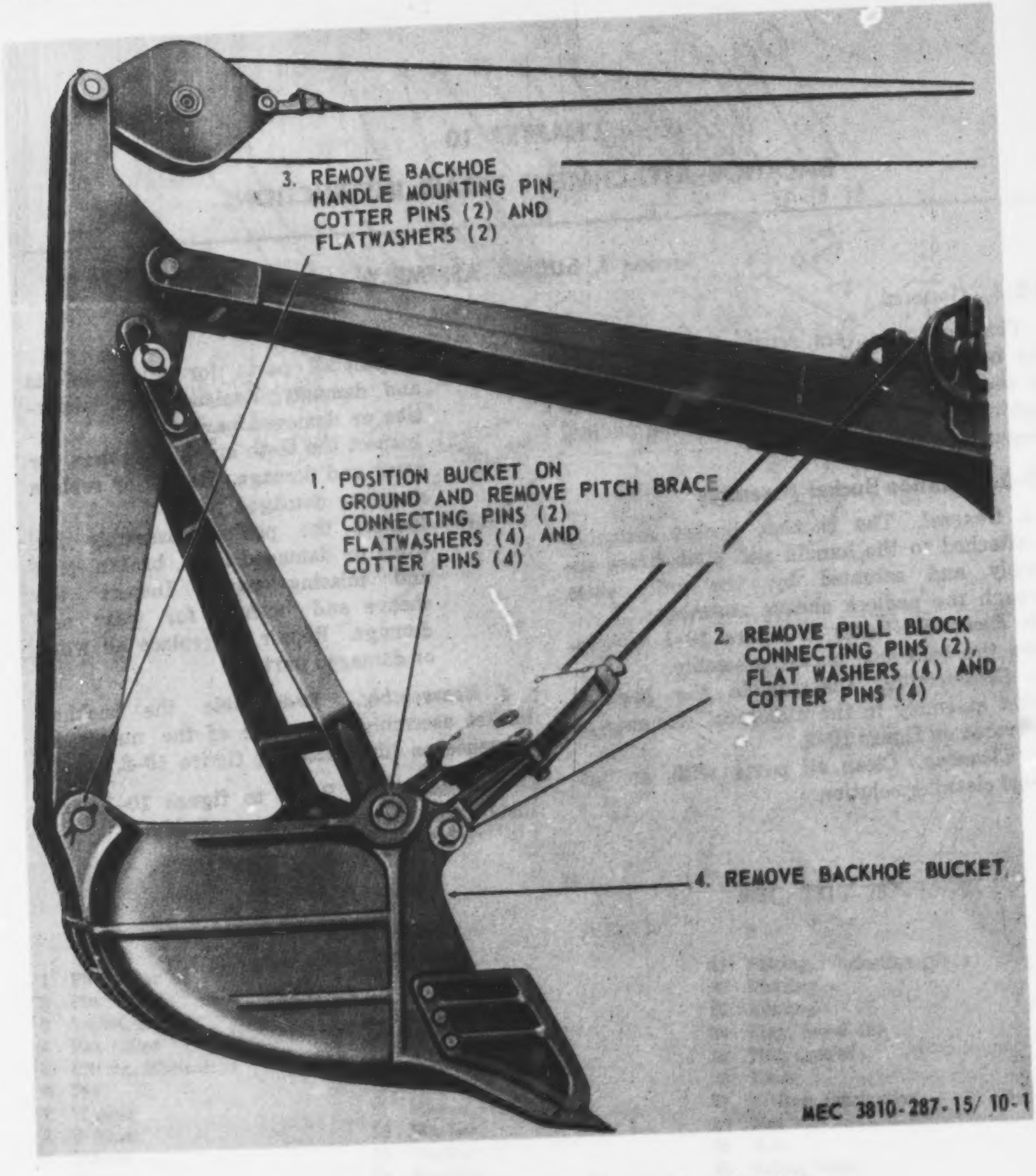
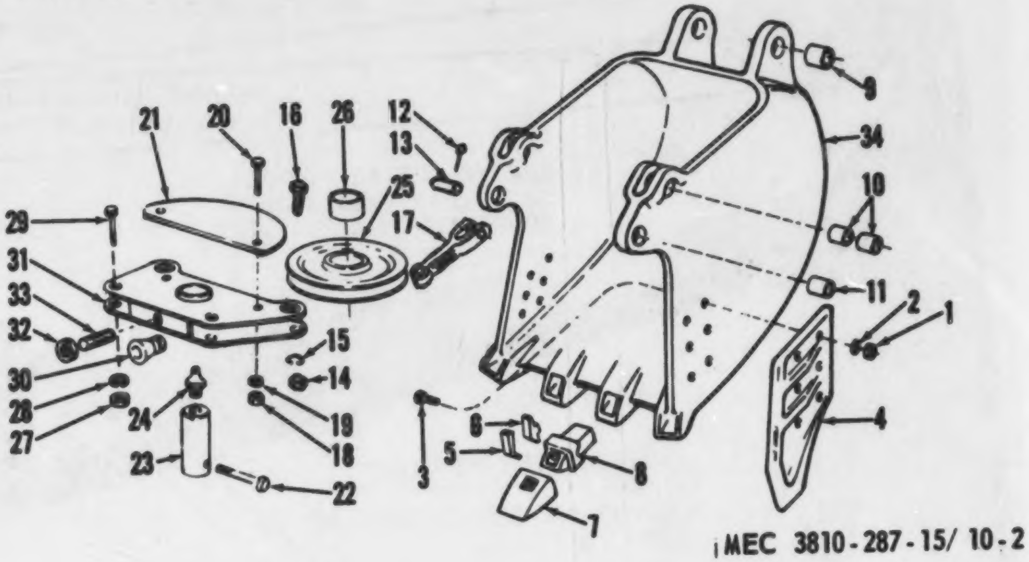

3. REMOVE BACKHOE HANDLE MOUNTING PIN, COTTER PINS (2) AND FLATWASHERS (2)
1. POSITION BUCKET ON GROUND AND REMOVE PITCH BRACE CONNECTING PINS (2) FLATWASHERS (4) AND COTTER PINS (4)
2. REMOVE PULL BLOCK CONNECTING PINS (2), FLAT WASHERS (4) AND COTTER PINS (4)
4. REMOVE BACKHOE BUCKET
MEC 3810-287-15/ 10-1

Figure 10–1. Backhoe bucket assembly, removal and installation.



1	Nut (12)
2	Washer, lock (12)
3	Bolt, special (12)
4	Side cutter (2)
5	Keeper, lock
6	Keeper
7	Tooth (4)
8	Shank (4)
9	Bushing (2)
10	Bushing (4)
11	Bushing (2)
12	Pin, cotter (2)
13	Pin (2)
14	Nut (2)
15	Washer, lock (2)
16	Screw, cap (2)
17	Link (2)
18	Nut (2)
19	Washer, lock (2)
20	Screw, cap (2)
21	Cover plate
22	Bolt
23	Pin
24	Fitting, lubrication
25	Sheave
26	Bushing
27	Nut (2)
28	Washer, lock (2)
29	Bolt (2)
30	Guide, cable (2)
31	Frame
32	Nut, lock
33	Screw, set
34	Scoop

Figure 10-2. Backhoe bucket assembly, exploded view.

Section II. BACKHOE HANDLE AND PITCH BRAKE ASSEMBLY

10-3. General

This section covers repair instructions on the backhoe handle and pitch brace assembly. It consists of the handle, pitch brace, bushings and attaching pins.

10-4. Backhoe Handle and Pitch Brace Assembly

a. General. The backhoe handle and pitch brace assembly is attached to the boom and the bucket assemblies. The handle acts as a lever between the bucket and boom, and the pitch brace determines the cutting angle of the bucket.

b. Removal.

(1) Remove the backhoe bucket assembly (para 10-2).

(2) Refer to figure 10-3 and remove the backhoe handle and pitch brace assembly.

c. Disassembly. Disassemble the backhoe handle and pitch brace assembly in the numerical sequence as illustrated on figure 10-4.

best copy available

Reproduced from poor document.

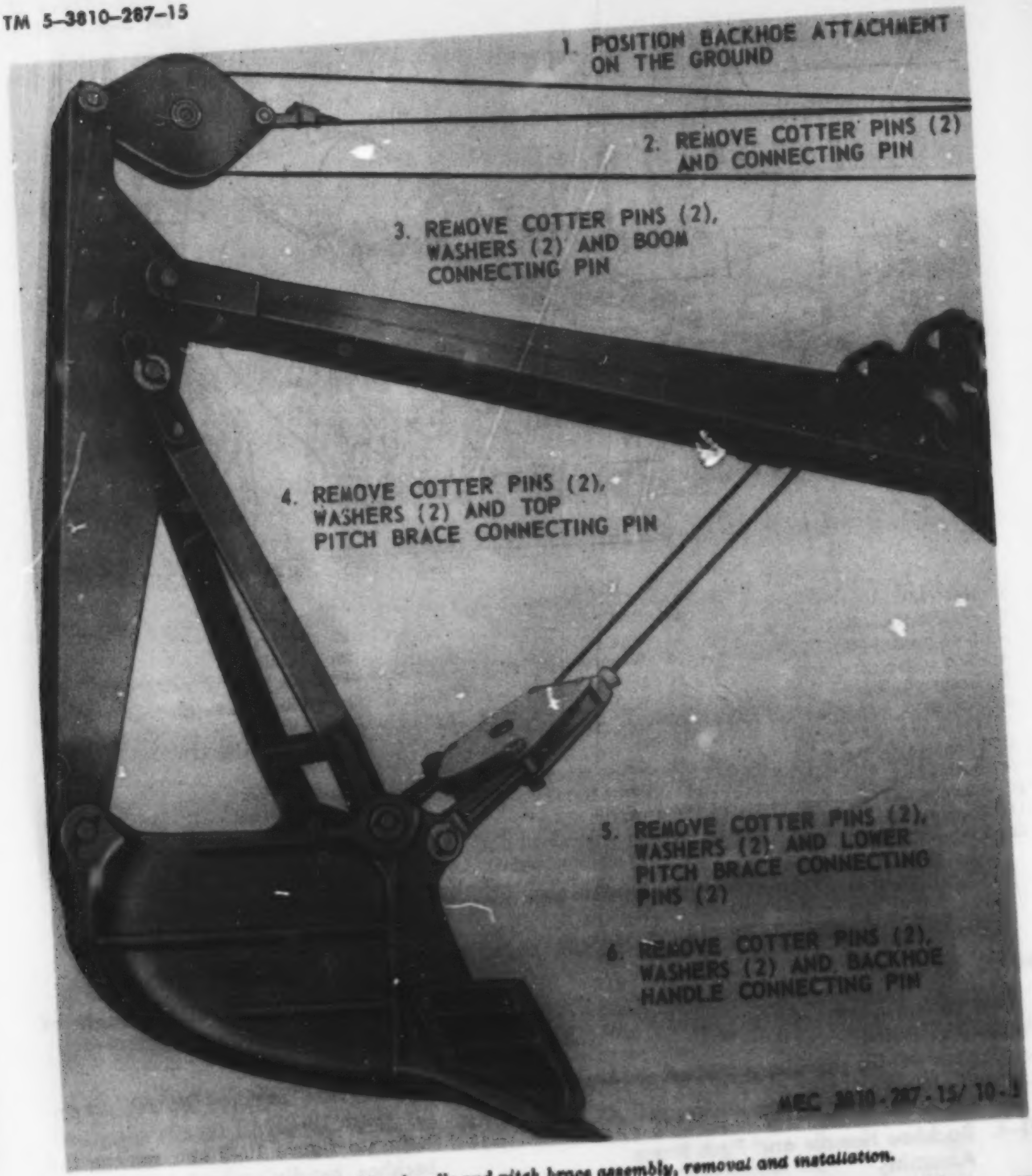

1. POSITION BACKHOE ATTACHMENT ON THE GROUND
2. REMOVE COTTER PINS (2) AND CONNECTING PIN
3. REMOVE COTTER PINS (2), WASHERS (2) AND BOOM CONNECTING PIN
4. REMOVE COTTER PINS (2), WASHERS (2) AND TOP PITCH BRACE CONNECTING PIN
5. REMOVE COTTER PINS (2), WASHERS (2) AND LOWER PITCH BRACE CONNECTING PINS (2)
6. REMOVE COTTER PINS (2), WASHERS (2) AND BACKHOE HANDLE CONNECTING PIN
MEC 3810-287-15/ 10-

Figure 10–3. Backhoe handle and pitch brace assembly, removal and installation.

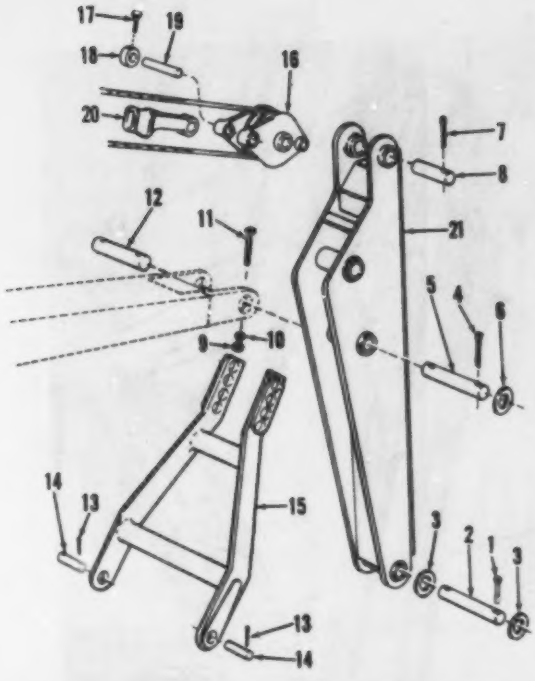
d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

(2) Inspect all pins, bushings and sheaves for wear and damage. Replace worn or damaged parts.

f. Reassembly. Reassemble the backhoe handle and pitch brace assembly in reverse of



MEC 3810-287-15/ 1'

Figure 10-4. Backhoe handle and pitch brace assembly, exploded view.

1	Pin, cotter
2	Pin
3	Washer, flat (2)
4	Pin, cotter
5	Pin
6	Washer, flat
7	Pin, cotter
8	Pin
9	Nut (2)
10	Washer, lock (2)
11	Bolt (2)
12	Pin
13	Pin, cotter
14	Pin
15	Pitch brace
16	Pulley and block assembly
17	Bolt
18	Collar
19	Pin
20	Socket, cable

Figure 10-4—Continued.

the numerical sequence as illustrated on figure 10-4.

g. Installation.

(1) Refer to figure 10-3 and install the backhoe handle and pitch brace assembly.

(2) Install the backhoe bucket assembly (para 10-2).

Section III. BACKHOE BOOM ASSEMBLY

10-5. General

This section covers repair instructions on the backhoe boom assembly. It consists of the boom weldment, shipper shaft, sheaves, bushings and attaching pins.

10-6. Backhoe Boom Assembly

a. General. The backhoe boom assembly is mounted on the turntable bed and supports the handle and bucket assembly.

b. Removal.

(1) Remove the backhoe bucket assembly (para 10-2).

(2) Remove the backhoe handle and pitch brace assembly (para 10-4).

(3) Refer to figure 10-5 and remove the backhoe boom assembly.

c. Disassembly. Disassemble the backhoe boom assembly in the numerical sequence as illustrated on figure 10-6.

d. Cleaning. Clean all parts with an approved cleaning solution.

e. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

(2) Inspect all sheaves and bushings for wear and damage. Replace worn or damaged parts.

f. Reassembly. Reassemble the backhoe boom assembly in reverse of the numerical sequence as illustrated on figure 10-6.

g. Installation.

(1) Refer to figure 10-5 and install the backhoe boom assembly.

(2) Install the backhoe handle pitch brace assembly (para 10-4).

(3) Install the backhoe bucket assembly (para 10-2).

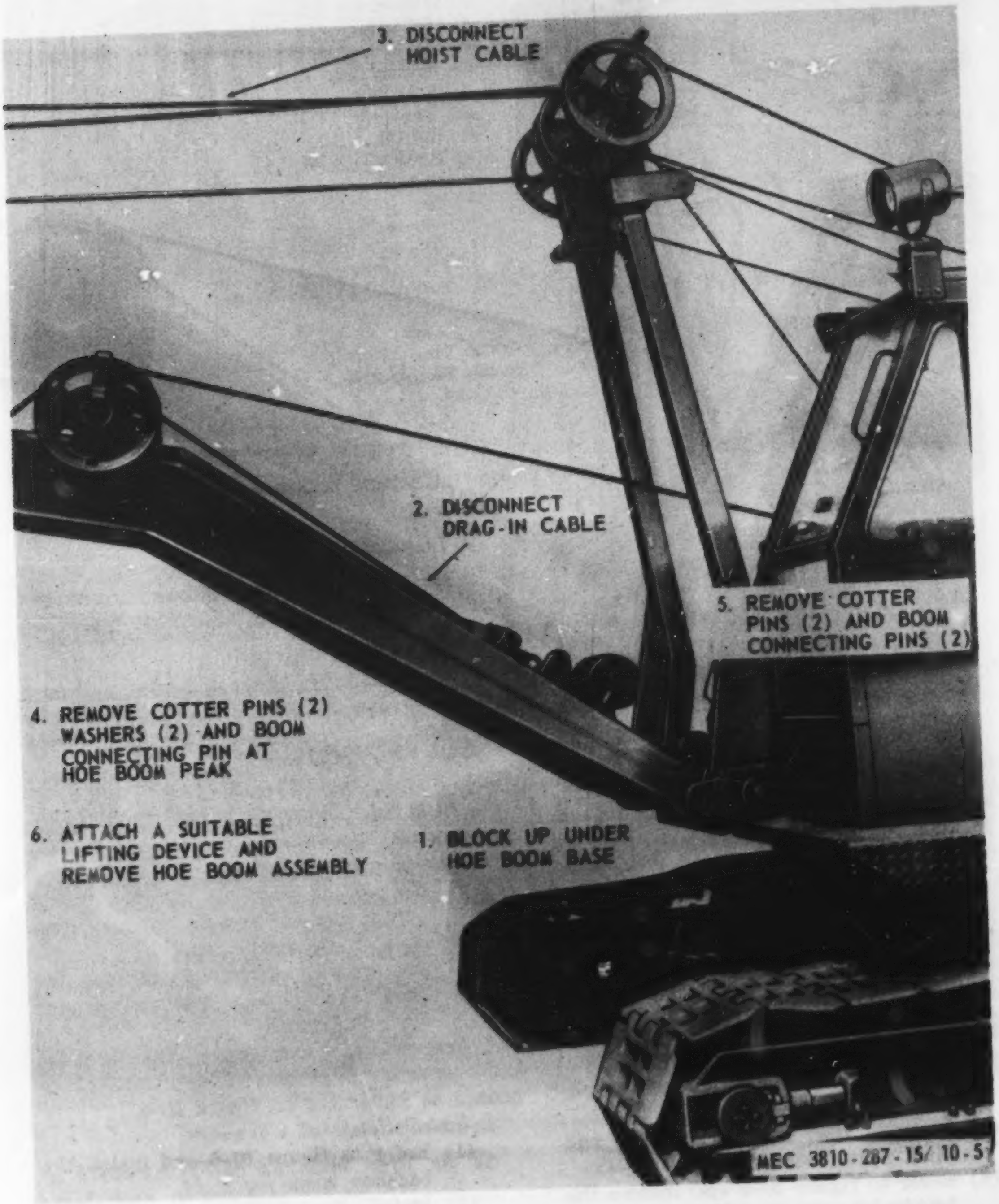
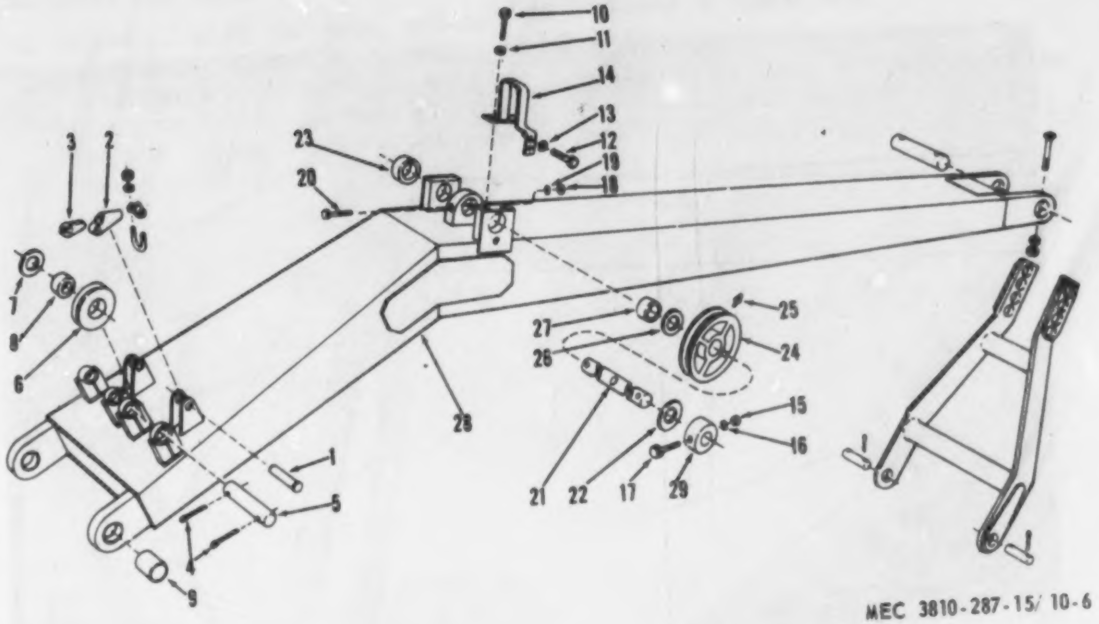

3. DISCONNECT HOIST CABLE
2. DISCONNECT DRAG-IN CABLE
5. REMOVE COTTER PINS (2) AND BOOM CONNECTING PINS (2)
4. REMOVE COTTER PINS (2) WASHERS (2) AND BOOM CONNECTING PIN AT HOE BOOM PEAK
6. ATTACH A SUITABLE LIFTING DEVICE AND REMOVE HOE BOOM ASSEMBLY
1. BLOCK UP UNDER HOE BOOM BASE
MEC 3810-287-15/ 10-5

Figure 10-5. Backhoe boom assembly, removal and installation.



1	Pin
2	Socket, cable
3	Wedge, cable
4	Pin (2)
5	Pin
6	Sheave roller
7	Washer, flat
8	Bushing
9	Bushing
10	Screw, cap
11	Washer, lock
12	Screw, cap
13	Washer, lock
14	Guard, cable
15	Nut
16	Washer, lock
17	Bolt
18	Nut
19	Washer, lock
20	Bolt
21	Shaft
22	Washer, flat
23	Collar
24	Sheave
25	Fitting, lubrication
26	Washer, flat
27	Bushing

Figure 10-6. Backhoe boom assembly, exploded view.

Section IV. BACKHOE MAST ASSEMBLY

10-7. General

This section covers repair of the backhoe mast assembly. It consists of the mast sheaves, bushings and attaching pins.

10-8. Backhoe Mast Assembly

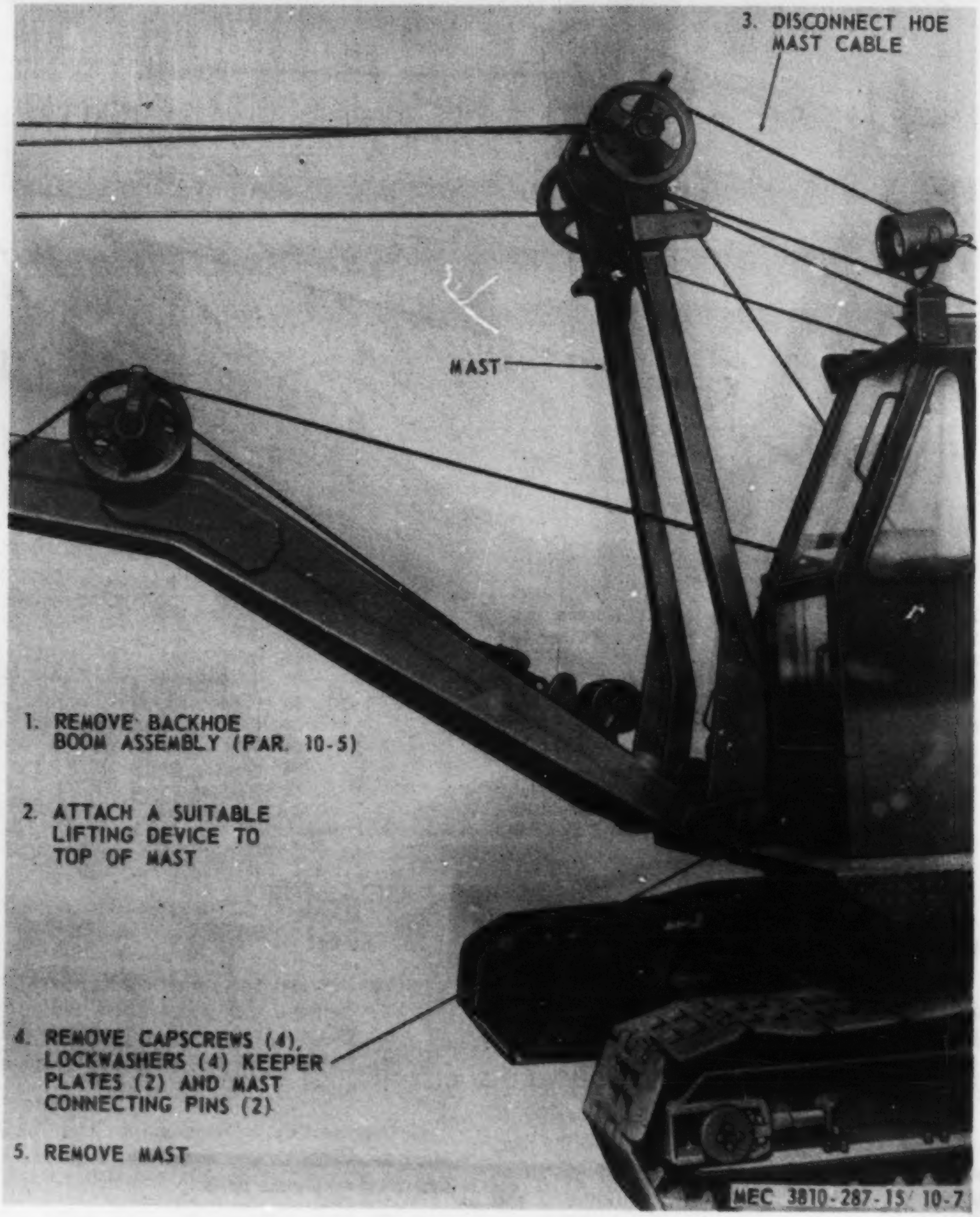
a. General. The backhoe mast assembly is attached at the bottom of the turntable bed and supported at the top by the boom hoist cables. The mast assembly provides the sheaves required for reeving the backhoe assembly.

b. Removal.

(1) Remove the hoist cable (para 2-6).
(2) Remove the boom hoist cable (para 2-6).
(3) Refer to figure 10-7 and remove the backhoe mast assembly.

c. Disassembly. Disassemble the backhoe mast assembly in the numerical sequence as illustrated on figure 10-8.

d. Cleaning. Clean all parts with an approved cleaning solution.



1. REMOVE BACKHOE BOOM ASSEMBLY (PAR. 10-5)

2. ATTACH A SUITABLE LIFTING DEVICE TO TOP OF MAST

3. DISCONNECT HOE MAST CABLE

4. REMOVE CAPSCREWS (4), LOCKWASHERS (4) KEEPER PLATES (2) AND MAST CONNECTING PINS (2)

5. REMOVE MAST

Figure 10-7. Backhoe mast assembly, removal and installation.

e. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

(2) Inspect the sheaves and bushings for wear and damage. Replace worn or damaged parts.

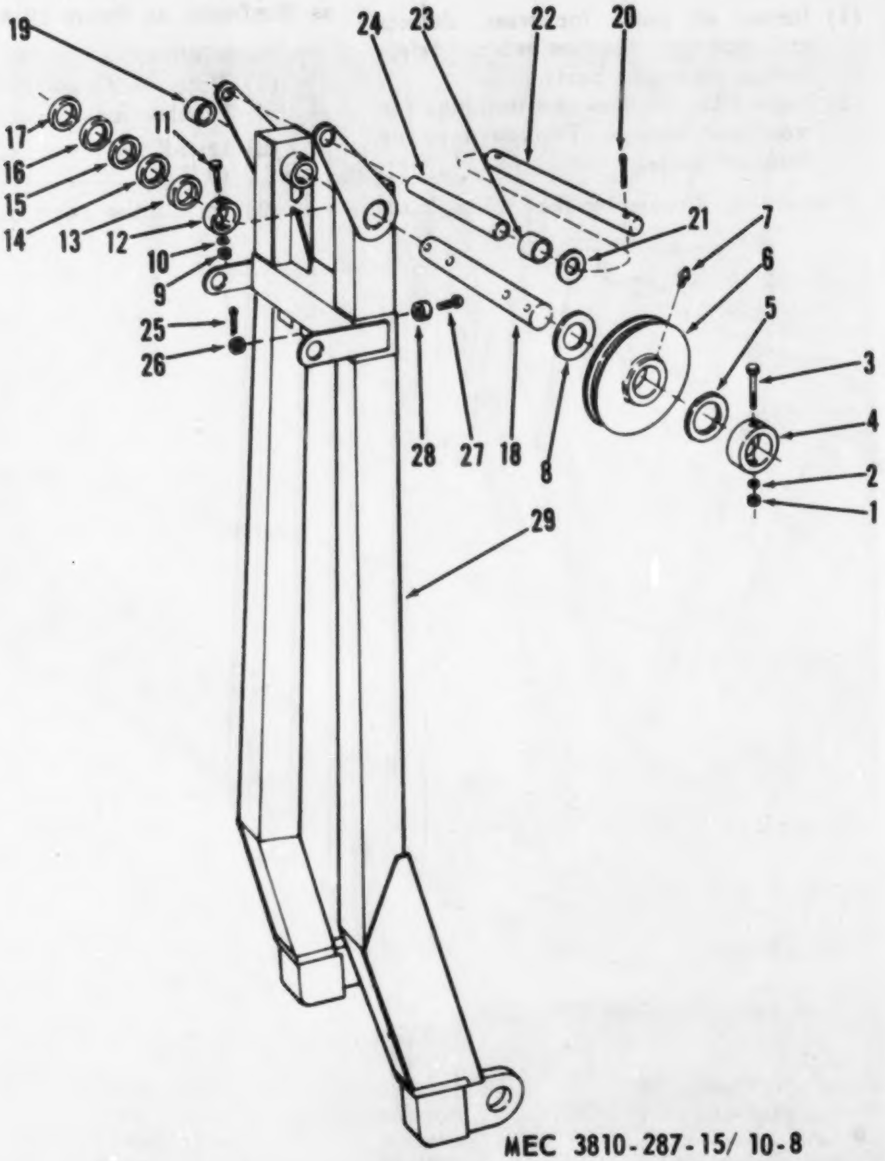
f. Reassembly. Reassemble the backhoe mast assembly in reverse of the numerical sequence as illustrated on figure 10–8.

g. Installation.

(1) Refer to figure 10–7 and install the backhoe mast assembly.

(2) Install the boom hoist cable (para 2–6).

(3) Install the hoist cable (para 2–6).


19
24
23
22
20
17
16
15
14
13
12
11
10
9
21
7
6
5
25
26
3
4
2
1
28
27
18
8
29

MEC 3810-287-15/ 10-8

1	Nut
2	Washer, lock
3	Bolt
4	Collar
5	Washer, flat
6	Sheave (4)
7	Fitting, lubrication
8	Washer, flat
9	Nut
10	Washer, lock
11	Bolt
12	Collar
13	Spacer
14	Spacer
15	Spacer
16	Spacer
17	Spacer
18	Shaft
19	Bushing
20	Pin, cotter
21	Washer, flat
22	Shaft
23	Spacer, pipe
24	Spacer, pipe
25	Pin, cotter (2)
26	Nut (2)
27	Bolt (2)
28	Bumper (2)

Figure 10-8. Backhoe mast assembly, exploded view.

CHAPTER 11

SHOVEL FRONT ATTACHMENT REPAIR INSTRUCTIONS

Section I. DIPPER ASSEMBLY

11-1. General

The dipper assembly is located at the end of, and attached to the dipper handle. The bucket consists of a shell, door assembly, bail assembly, teeth and bucket latch assembly.

11-2. Dipper Assembly

a. Removal and Disassembly. Remove and disassemble the dipper in the numerical sequence as illustrated on figure 11-1.

b. Cleaning. Clean all parts with an approved cleaning solution.

c. Inspection and Repair.

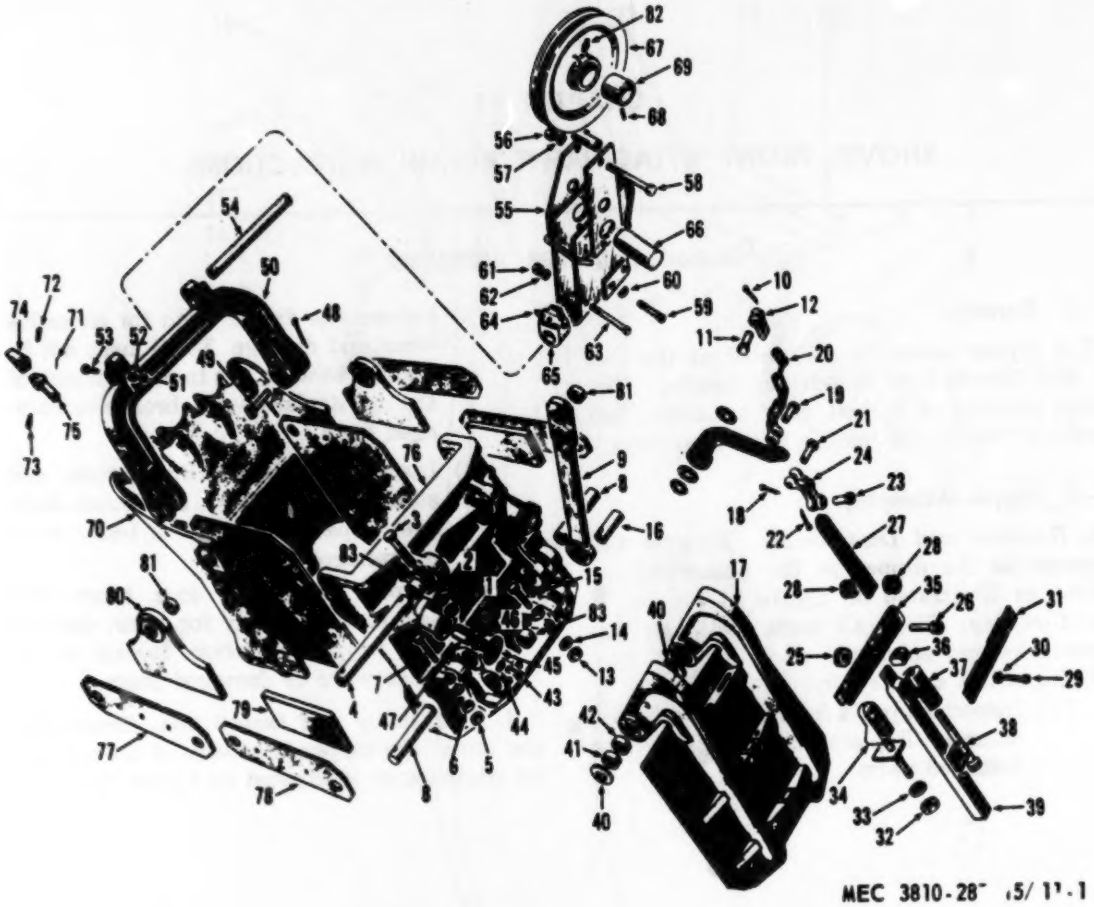
(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

(2) Inspect the dipper teeth for excessive wear and damage. Teeth must not be allowed to wear less than 1 1/2 inch of the lip. Replace worn, broken or damaged teeth.

(3) Inspect the dipper lip, bottom and sides for wear holes and other damage. Repair or replace a badly worn or damaged dipper.

(4) Inspect the dipper door, hinge pins and latch assembly for wear, damage and proper operation. Repair or replace worn or damaged parts.

d. Reassembly and Installation. Reassemble and install the dipper in reverse of the numerical sequence as illustrated on figure 11-1.


82
67
69
68
56
57
58
55
66
54
50
61
62
60
59
10
12
72
74
71
48
64
11
53
52
63
20
65
49
51
81
19
75
21
73
9
24
8
76
23
16
18
3
70
22
27
83
2
28
1
17
15
81
28
35
26
31
80
83
40
46
14
25
36
30
13
29
45
37
7
43
42
79
4
38
47
44
41
77
6
5
34
39
33
78
8
40
32

MEC 3810-28 5/ 11.1

1	Nut (2)
2	Washer, lock (2)
3	Bolt (2)
4	Shaft
5	Nut
6	Washer, lock
7	Bolt
8	Shaft (2)
9	Brace (2)
10	Pin, cotter
11	Pin
12	Clevis
13	Nut
14	Washer, lock (2)
15	Bolt (2)
16	Pin (2)
17	Door, dipper
18	Pin, cotter
19	Pin
20	Chain, dipper trip
21	Pin
22	Pin, cotter
23	Pin
24	Clevis (2)
25	Nut
26	Bolt
27	Link
28	Spacers (4)
29	Screw, cap
30	Washer, lock
31	Bar
32	Nut
33	Washer
34	Anchor assembly
35	Lever
36	Nut
37	Spring
38	Bolt
39	Bar
40	Washer
41	Bushing
42	Bushing
43	Bolt (2)
44	Washer
45	Washer
46	Sleeve
47	Bumper
48	Pin, cotter
49	Pin
50	Bail

Figure 11-1. Dipper assembly, exploded view.

51	Nut (2)	62	Washer, lock (2)	73	Wedge, lock (4)
52	Washer, (2)	63	Bolt (2)	74	Tooth (4)
53	Bolt (2)	64	Fitting, lubrication	75	Shank
54	Shaft	65	Bearing	76	Dipper back
55	Padlock frame assembly	66	Pin	77	Side bar
56	Nut	67	Sheave	78	Side bar
57	Washer, lock	68	Dowel	79	Plate
58	Bolt	69	Bushing	80	Bearing bracket
59	Bolt	70	Dipper front	81	Bushing
60	Washer, lock	71	Pin (4)	82	Fitting
61	Nut (2)	72	Wedge, lock (4)	83	Bushing (4)

Figure 11-1—Continued.

Section II. DIPPER HANDLE ASSEMBLY

11-3. General

The dipper handle assembly is attached to the shipper shaft at the center of the boom and provides the crowd action and support of the dipper assembly. It consists primarily of the handle and sheaves.

11-4. Dipper Handle Assembly

a. Removal and Disassembly.

(1) Remove the dipper assembly (para 11-2).

(2) Remove and disassemble the dipper handle assembly in the numerical sequence as illustrated on figure 11-2.

b. Cleaning. Clean all parts with an approved cleaning solution.

c. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

(2) Inspect the sheave, bushing and pin for excessive wear and damage. Replace worn or damaged parts.

(3) Inspect the cable attaching and adjusting mechanism for missing parts and damage. Replace damaged or missing parts.

d. Reassembly and Installation.

(1) Reassemble and install the dipper handle assembly in reverse of the numerical sequence as illustrated on figure 11-2.

(2) Install the dipper assembly (para 11-2).

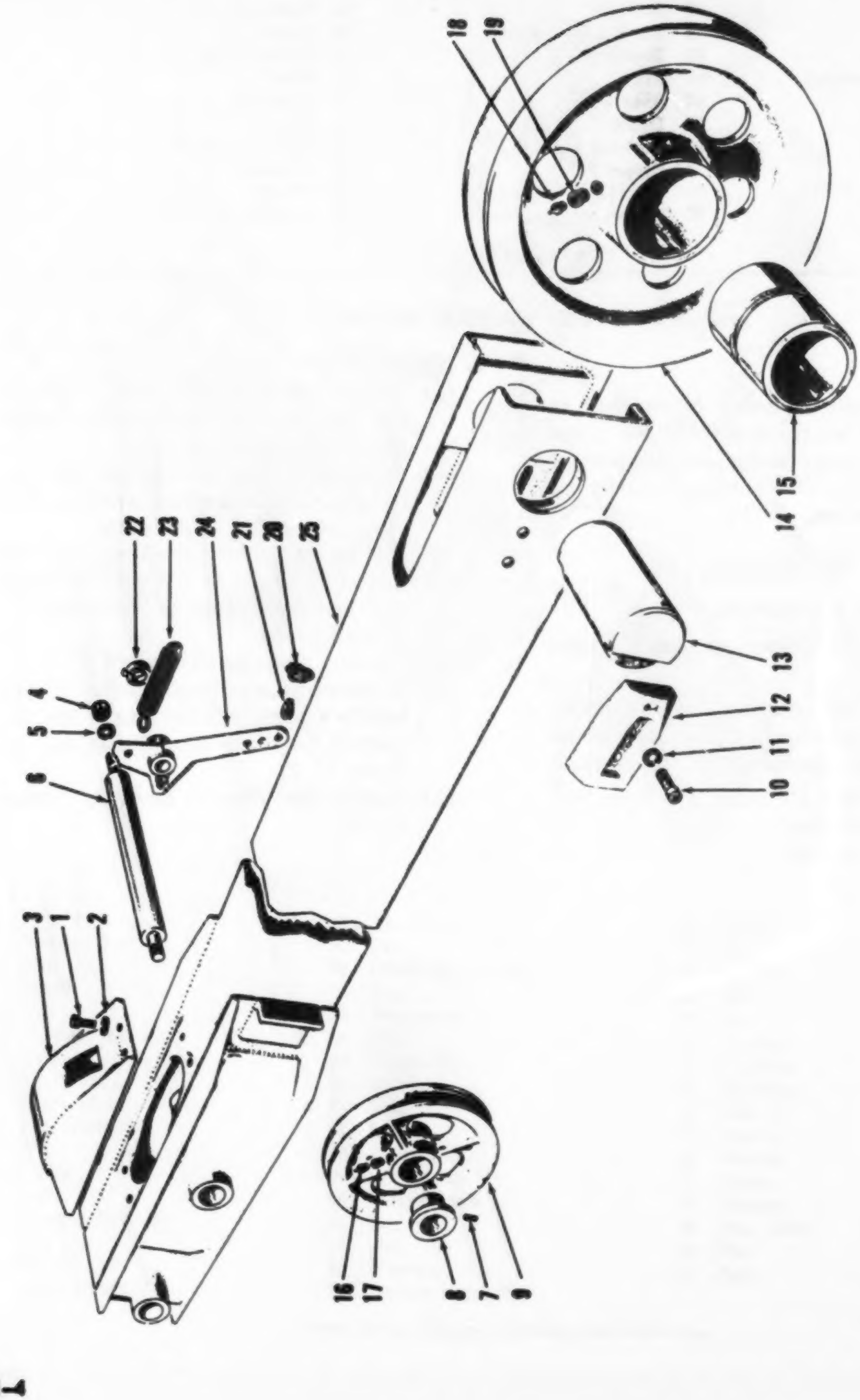

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
MEC 3810-287-15/11-2

Figure 11-2. Dipper handle assembly, exploded view.

1 Screw, cap (4)
2 Washer, lock (4)
3 Cover
4 Nut (2)
5 Washer, lock (2)
6 Shaft
7 Dowel (2)
8 Bushing (2)
9 Sheave
10 Screw, cap (2)
11 Washer, lock (2)
12 Lock
13 Shaft
14 Sheave
15 Bushing
16 Fitting, lubrication
17 Bushing
18 Fitting, lubrication
19 Bushing
20 Clamp, cable
21 Eye, cable
22 Collar
23 Spring
24 Lever, dipper trip
25 Dipper handle

Figure 11-8—Continued.

Section III. SHIPPER SHAFT ASSEMBLY

11-5. General

The shipper shaft assembly is mounted in the center of the boom and provide support for the dipper handle assembly. It consists primarily of a shaft, bushings, saddle and wear bars.

11-6. Shipper Shaft Assembly

a. Removal.

(1) Remove the dipper assembly (para 11-2).

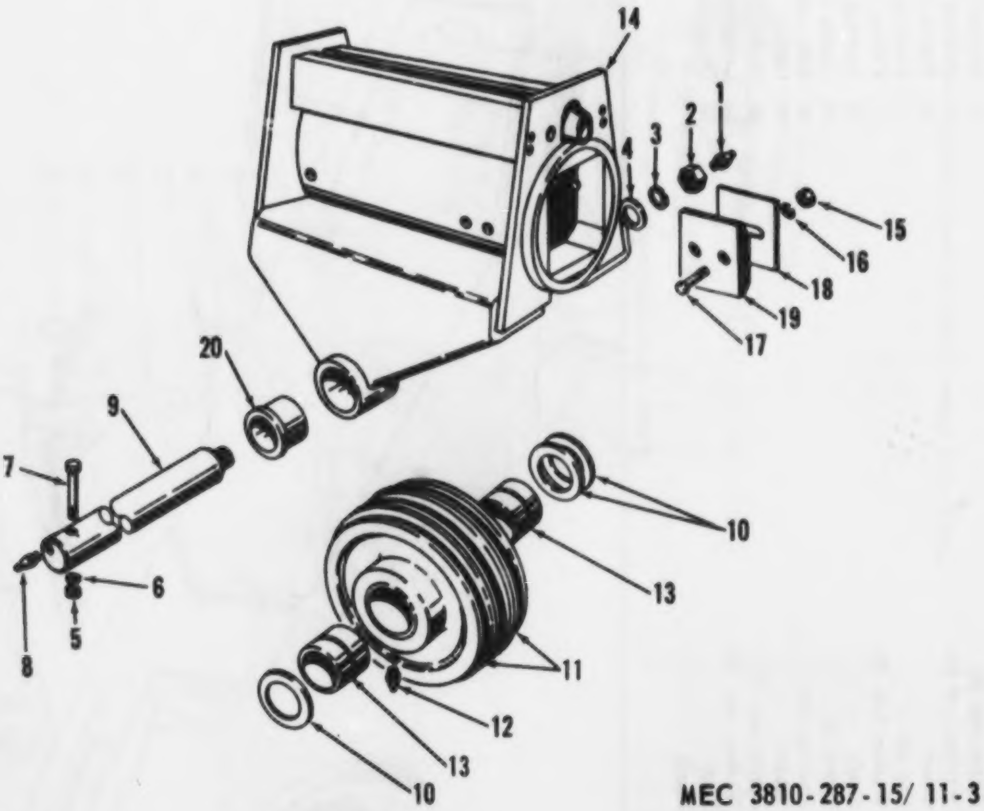
(2) Remove the handle assembly (para 1-4).

(3) Refer to figure 11-3 and remove and disassemble the shipper shaft assembly.

b. Cleaning. Clean all parts with an approved cleaning solution.

c. Inspection and Repair.

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.



MEC 3810-287-15/ 11-3

1 Fitting, lubrication
2 Nut
3 Washer, lock
4 Washer, flat
5 Nut
6 Washer, flat
7 Bolt
8 Fitting, lubrication
9 Shaft
10 Washer, flat
11 Sheave (2)
12 Fitting, lubrication (2)
13 Bushing (2)
14 Shipper shaft housing
15 Nut (2)
16 Washer, lock (2)
17 Bolt (2)
18 Shim
19 Shim retainer
20 Bushing (2)

Figure 11-3. Shipper shaft assembly, exploded view.

(2) Inspect the shaft and bushings for wear and damage. Replace worn or damaged parts.

(3) Inspect the wear bars for wear and damage. Replace worn or damaged parts.

d. *Reassembly and Installation.*

(1) Reassemble and install the shipper shaft assembly in reverse of the numerical sequence as illustrated on figure 11-3.

(2) Install the dipper handle (para 11-4).

(3) Install the dipper assembly (para 11-2).

Section IV. SHOVEL BOOM ASSEMBLY

11-7. General

The shovel boom is attached at the base to the superstructure turntable bed. It supports the dipper and handle assemblies. The outer end of the boom is supported by the boom hoist cables. The shovel boom consists of the boom weldment, cable sheaves, guards, bushings and shafts.

11-8. Shovel Boom Assembly

a. *Removal and Disassembly.*

(1) Remove the shovel front assembly (para 2-12).

(2) Remove the dipper assembly (para 11-2).

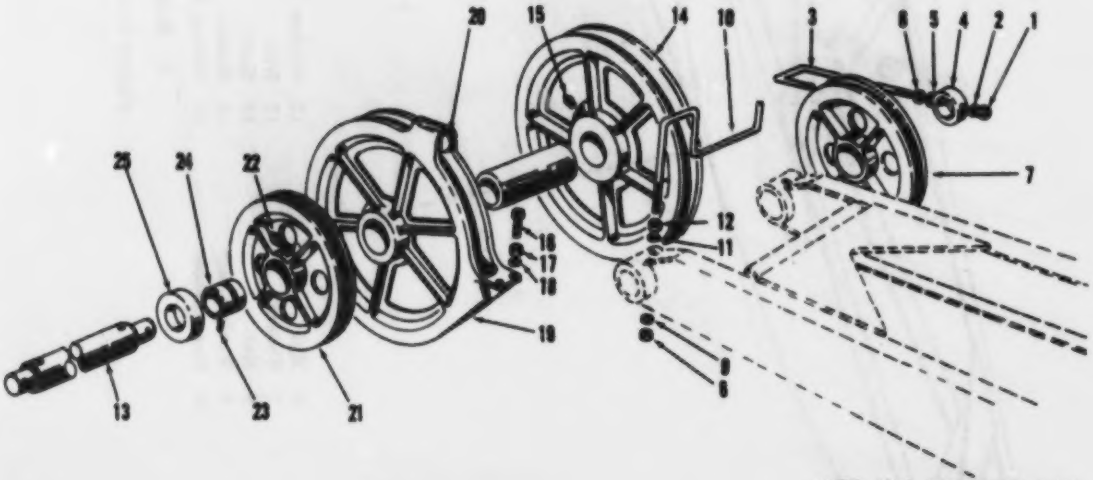
(3) Remove the handle assembly (para 11-4).

(4) Remove and disassemble the shovel boom assembly in the numerical sequence as illustrated on figure 11-4.

b. *Cleaning.* Clean all parts with an approved cleaning solution.

c. *Inspection and Repair.*

(1) Inspect all parts for wear, defects and damage. Replace worn, defective or damaged parts.

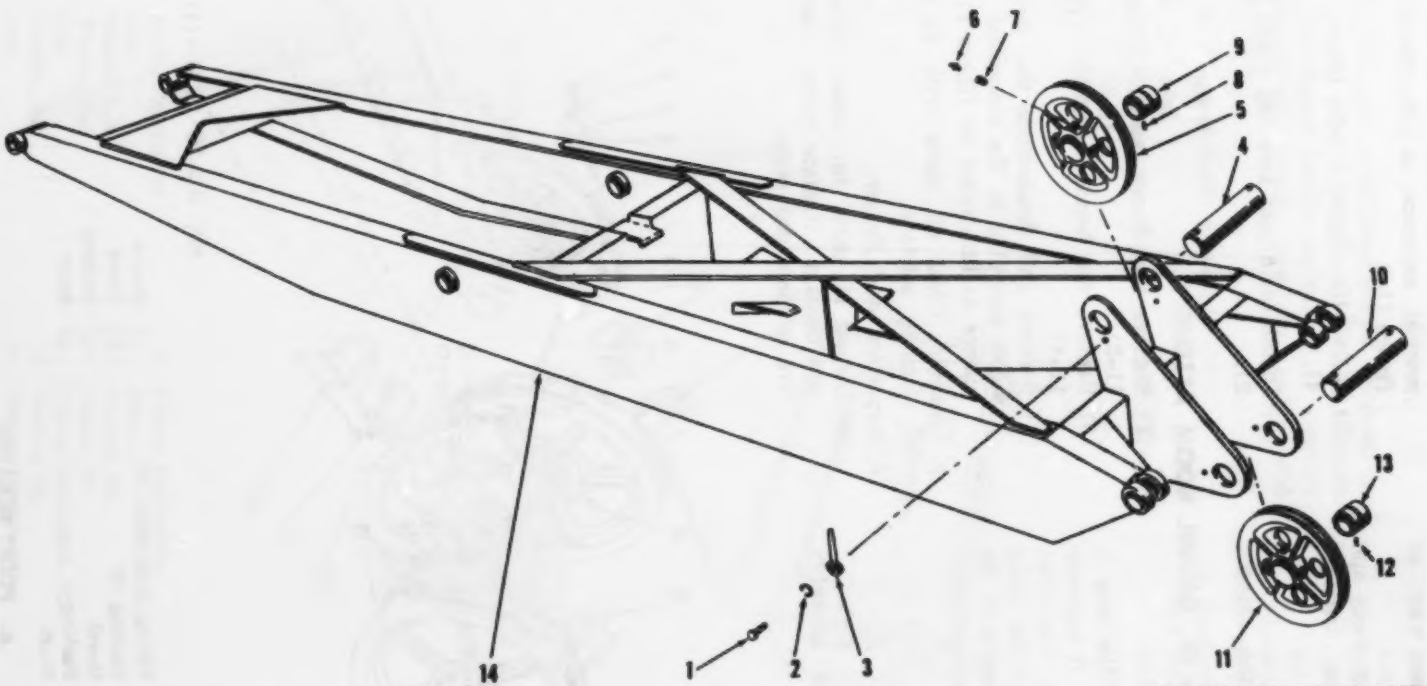


MEC 3810-287-15/11-4 (1)

1	Screw, cap (2)
2	Washer, lock (2)
3	Pin, lock (2)
4	Shaft
5	Sheave
6	Fitting, lubrication (2)
7	Bushing (2)
8	Dowel
9	Bushing
10	Shaft
11	Sheave
12	Dowel
13	Bushing
14	Boom

A. POINT SHEAVES

Figure 11-4 (1). Shovel boom assembly, exploded view.



MEC 3810-287-15/ 11-4(2)

1	Nut	6	Nut	11	Washer, lock	16	Screw, cap (2)	21	Sheave
2	Washer, lock	7	Sheave	12	Nut	17	Nut (2)	22	Fitting, lubrication (2)
3	Guard, cable	8	Nut	13	Shaft	18	Washer, lock (2)	23	Dowel
4	Collar	9	Washer, lock	14	Sheave	19	Sheave, dead-end	24	Bushing
5	Washer, lock	10	Guard, cable	15	Fitting, lubrication (2)	20	Wedge	25	Collar

B. BASE SHEAVES

Figure 11-4 (2).—Continued.

(2) Inspect the boom foot bushings for wear and damage. Replace worn or damaged parts.

(3) Inspect the point shaft and sheaves for wear and damage. Inspect sheave bushings for wear and damage. Replace worn or damaged parts.

d. Reassembly and Installation.

(1) Reassemble and install the shovel boom assembly in reverse of the numerical sequence as illustrated on figure 11-4.

(2) Install the handle assembly (para 11-4).

(3) Install the dipper assembly (para 11-2).

(4) Install the shovel front assembly (para 2-12).

Section V. DIPPER TRIP ASSEMBLY

11-9. General

The L-36M uses a Morin dipper trip assembly mounted on the right hand end of the clutch shaft assembly. It consists of clutch plates and adjustments, and is connected to the dipper latch assembly through cable and pulleys. The dipper trip is controlled electrically from the operator's compartment.

11-10. Dipper Trip Assembly

a. Removal. Refer to figure 11-5 and remove the dipper trip assembly.

b. Disassembly. Disassemble the dipper trip assembly in the numerical sequence as illustrated on figure 11-6.

c. Cleaning. Clean all parts with an approved cleaning solution.

d. Inspection and Repair. Inspect all parts for wear, defects, and damage. Replace worn, defective or damaged parts.

e. Reassembly. Reassemble the dipper trip assembly in reverse of the numerical sequence as illustrated on figure 11-6.

f. Installation. Refer to figure 11-5 and install the dipper trip assembly.

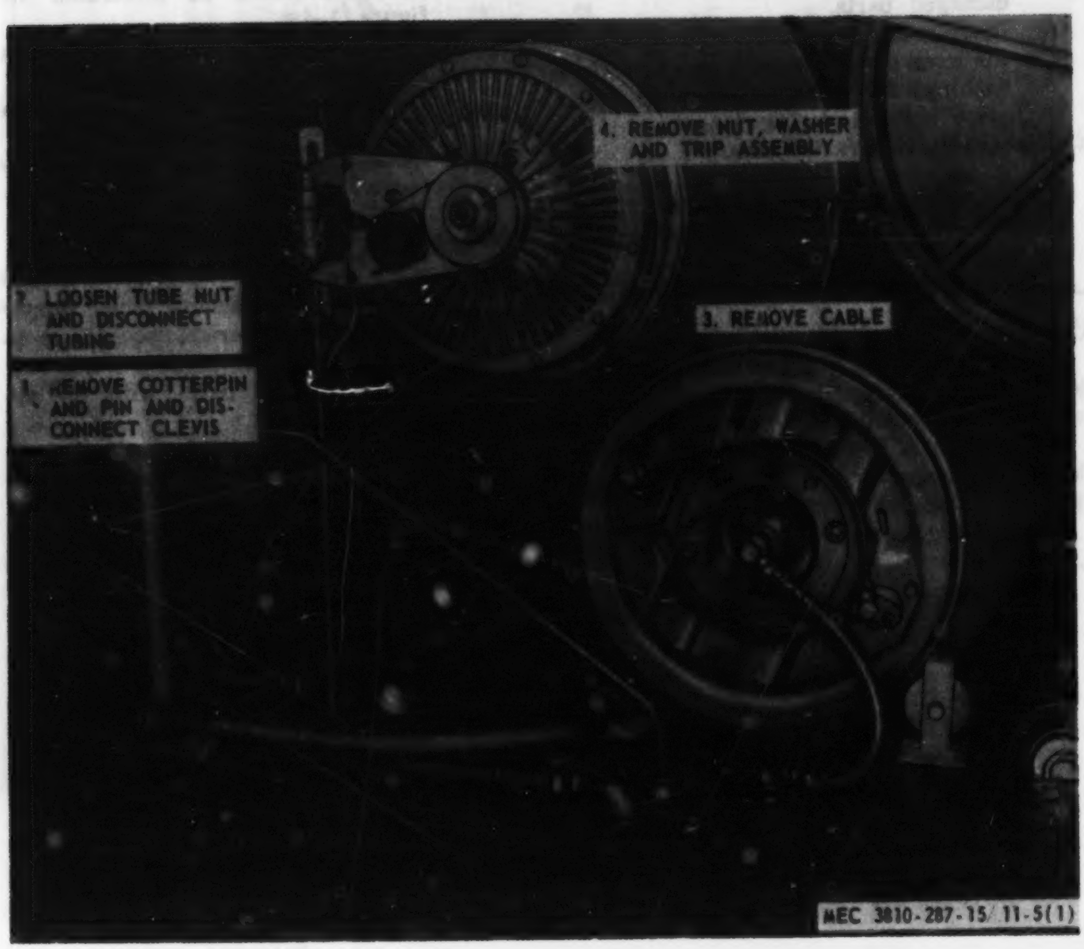

4. REMOVE NUT, WASHER AND TRIP ASSEMBLY
2. LOOSEN TUBE NUT AND DISCONNECT TUBING
3. REMOVE CABLE
1. REMOVE COTTERPIN AND PIN AND DISCONNECT CLEVIS
MEC 3810-287-15/11-5(1)

Figure 11-5 (1). Dipper trip and solenoid assembly, removal and installation.

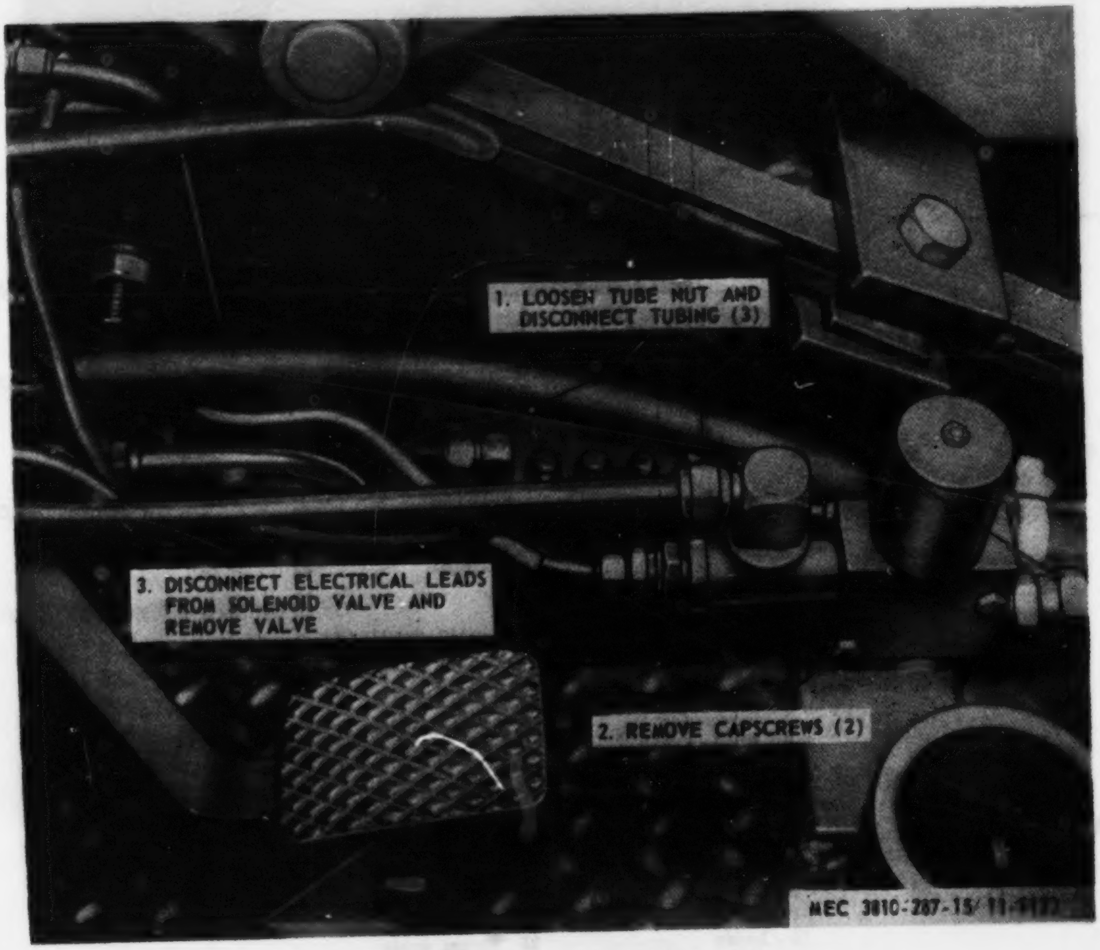
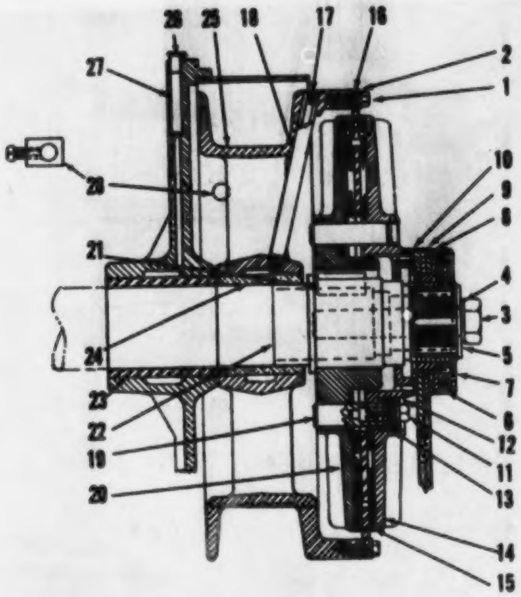

1. LOOSEN TUBE NUT AND DISCONNECT TUBING (3)
3. DISCONNECT ELECTRICAL LEADS FROM SOLENOID VALVE AND REMOVE VALVE
2. REMOVE CAPSCREWS (2)
MEC 3810-287-15/ 11-

Figure 11-5 (2).—Continued.


26
25
18
17
16
2
1
27
28
10
9
8
21
4
3
24
5
7
23
6
22
12
19
11
20
13
14
15

MEC 3810-287-15/ 11-6

1	Screw, cap	16	Plate, anchor
2	Washer, lock	17	Pipe plug
3	Screw, cap	18	Pipe
4	Washer, lock	19	Pin
5	Washer, flat	20	Plate, inner
6	Screw, set	21	Key
7	Collar	22	Spacer
8	Shim (2)	23	Bushing
9	Lever	24	Bushing
10	Lever	25	Drum, cable
11	Bolt, special	26	Cap, lubrication
12	Washer, flat	27	Tube, lubrication
13	Spring	28	Clamp, cable
14	Plate, outer	29	Rivet
15	Disc, clutch	30	Dowel

Figure 11-6. Dipper trip assembly, cross-sectional view.

APPENDIX A

REFERENCES

A-1. Fire Protection

TB 5-4200-200-10	Hand Portable Fire Extinguishers for Army Users.

A-2. Lubrication

C9100-IL	Petroleum, Petroleum-Base Products and Related Materials.
LO 5-3810-287-15	Lubrication Order.

A-3. Painting

TM 9-213	Painting Instructions for Field Use.

A-4. Preventive Maintenance

TM 9-6140-200-15	Storage Batteries, Lead-Acid Type.
TM 38-750	Army Equipment Record Procedures.
TM 9-1870-1 (used only when applicable)	Care and Maintenance of Pneumatic Tires.
TB ENG 347 (used only when applicable)	Winterization Techniques for Engineer Equipment.

APPENDIX B

BASIC ISSUE ITEMS LIST AND MAINTENANCE AND OPERATING SUPPLIES

Section I. INTRODUCTION

B-1. Scope

This appendix lists items which accompany the Thew-Lorain crane-shovel or are required for installation, operation, or operator's maintenance.

B-2. General

This Basic Issue Items List is divided into the following sections:

a. Basic Issue Items—Section II. A list of items which accompany the Thew-Lorain crane-shovel or are required for the installation, operation, or operator's maintenance.

b. Maintenance and Operating Supplies—Section III. A listing of maintenance and operating supplies required for initial operation.

B-3. Explanation of Columns

The following provides an explanation of columns in this tabular list of basic issue items, section II.

a. Source, Maintenance, and Recoverability Codes (SMR), Column 1:

(1) Source Code, indicates the selection status and source for the listed item. Source codes are:

Code	Explanation
P	Applied to repair parts which are stocked in or supplied from GSA/DSA or Army supply system, and authorized for use at indicated maintenance categories.
M	Applied to repair parts which are not procured or stocked but are to be manufactured at indicated maintenance categories.
A	Applied to assemblies which are not procured or stocked as such, but made up of two or more units, each of which carry individual stock numbers and descriptions and are procured and stocked and can be assembled by units at indicated maintenance categories.
X	Applied to parts and assemblies which are not procured or stocked, the mortality of which is normally below that of the applicable end item, and the failure of which should result in retirement of the end item from the supply system.
X1	Applied to repair parts which are not procured or stocked, the requirement for which will be supplied by use of the next higher assembly or components.
X2	Applied to repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain them through cannibalization; if not obtainable through cannibalization, such repair parts will be requisitioned with supporting justification through normal supply channels.
C	Applied to repair parts authorized for local procurements. If not obtainable from local procurement, such repair parts will be requisitioned through normal supply channels with a supporting statement of nonavailability from local procurement.
G	Applied to major assemblies that are procured with PEMA (Procurement Equipment Missile Army) funds for initial issue only to be used as exchange assemblies at DSU and GSU level or returned to depot supply level.

Note. Source code is not shown on common hardware items known to be readily available in Army supply channels and through local procurement.

(2) Maintenance Code indicates the lowest category of maintenance authorized to install the listed item. The maintenance level codes are:

Code	Explanation
C	Operator/crew
O	Organizational maintenance

(3) Recoverability Code indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code	Explanation
R	Applied to repair parts and assemblies which are economically repairable at DSU and GSU activities and are normally furnished by supply on an exchange basis.
T	Applied to high dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts are normally repaired or overhauled at depot maintenance activities.
U	Applied to repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, high dollar value reusable casings and castings.

b. Federal Stock Number, Column 2. This column indicates the Federal stock number for the item.

c. Description, Column 3. This column indicates the Federal item name and any additional description of the item required. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parentheses. Repair parts quantities included in kits, sets, and assemblies are shown in front of the repair part name.

d. Unit of Issue, Column 4. This column indicates the unit used as a basis for issue, e.g., ea, pr, ft, yd, etc.

e. Quantity Incorporated in Unit Pack, Column 5. This column indicates the actual quantity contained in the unit pack.

f. Quantity Incorporated in Unit, Column 6. This column indicates the quantity of the item used in the functional group.

g. Quantity Authorized, Column 7. This column indicates the quantity of an item authorized the operator/crew to have on hand or to obtain as required. As required items are indicated with an asterisk.

h. Illustration, Column 8. This column is divided as follows:

(1) *Figure Number, column 8a.* Indicates the figure number of the illustration in which the item is shown.

(2) *Item Number, column 8b.* Indicates the callout number used to reference the item in the illustration.

B-4. Explanation of Columns Contained in Section III

a. Item. This column contains numerical sequenced item numbers, assigned to each component application, to facilitate reference.

b. Component Application. This column identifies the component application of each maintenance or operating supply item.

c. Source of Supply. This column is left blank. For identification of agencies assigned supply responsibility for parts, refer to appropriate Federal and Department of Army supply catalogs.

d. Federal Stock Number. The Federal stock number will be shown in this column and will be used for requisitioning purposes.

e. Description. The item and a brief description are shown.

f. Quantity Required for Initial Operation. This column lists the quantity of each maintenance or operating supply item required for initial operation of the equipment.

g. Quantity Required for 8 Hours Operation. Quantities listed represent the estimated requirements for an average eight hours of operation.

h. Notes. This column contains informative notes keyed to data appearing in the preceding column.

Section II. BASIC ISSUE ITEMS LIST

(1) Source, maint. and recov. code			(2) Federal stock No.	(3) Description	(4) Unit of issue	(5) Qty. inc. in unit pack	(6) Qty. inc. in unit	(7) Qty auth	(8) Illustration	
(A) Source	(B) Maint	(C) Recov							(A) Fig. No.	(B) Item or sym No.
				GROUP 31 — BASIC ISSUE ITEMS, MANUFACTURER INSTALLED 3100 — BASIC ISSUE ITEMS, MANUFACTURER OR DEPOT INSTALLED						
P	0		6140-057-2554	BATTERY, STORAGE: (96906) MS35000-3			2	2	B-1	1
P	0			BOOM, CRANE: 30 ft. lg. MIL STD			1	1	B-1	6
M	0			CABLE, JUMPER			2	2		
X2	0			CONNECTOR, ELECTRICAL			4	4		
P	0			WIRE, ELECTRICAL: No. AWG	FT.		2	2		
M	0			CABLE ASSEMBLY, SLAVE:			1	1	B-1	11
X2	0			CONNECTOR, PLUG, ELECTRICAL (96906) MS75057			2	2		
P	0			CABLE, ELECTRICAL: Sheathed	FT.		30	30		
P	0		7520-559-9618	CASE: Operations and Maintenance Publications, cotton duck, water repellent and mildew resistent. MIL-B-11743B (GE)			1	1	B-1	7
P	0		2590-505-6736	CASE: Rifle			1	1	B-1	9
				DEPARTMENT OF THE ARMY Lubrication Order LO 5-3810-287-12			1	1		
				DEPARTMENT OF THE ARMY Technical Manual TM 5-3810-287-12			1	1		
				EQUIPMENT LOG: C/O 1 ea:						
P	0		7510-889-3494	BINDER, LOOSE-LEAF:			1	1	B-1	26
				DEPARTMENT OF THE ARMY FORMS 2408, 2408-1, 2408-2, 2408-3, 2408-5, 2408-6, 2408-7, 2408-8, 2408-10, and 2408-14			1	1		
P	0		4210-889-2221	EXTINGUISHER, FIRE:			1	1	B-1	19
X2	0			HOOK, BLOCK: 12 1/2 Ton (59690) D-81556X			1	1	B-1	10
P	0			ROD, ANTI-ROTATION (59690) D-82087			2	2	B-1	21
P	0		6810-249-9354	SULFURIC ACID	GAL.			3	B-1	5
P	0			WIRE ROPE: 5/8 in. dia.	FT.		165	165	B-1	15
X2	0			WRENCH, SPECIAL: Clutch, Brake and Friction adjustment (59690) D-81408X			1	1	B-1	8
				WRENCH, SPECIAL: Track adjusting (59690) E-2128			1	1	B-1	26
				GROUP 32 — BASIC ISSUE ITEMS, TROOP INSTALLED						

(1) Source, maint. and recov. code			(2) Federal stock No.	(3) Description	(4) Unit of issue	(5) Qty. inc. in unit pack	(6) Qty. inc. in unit	(7) Qty auth	(8) Illustration	
(A) Source	(B) Maint	(C) Recov							(A) Fig. No.	(B) Item or sym No.
				3200 — BASIC ISSUE ITEMS, TROOP INSTALLED OR AUTHORIZED						
P	0		5120-224-1372	BAR: Pry, rolling head, 1/2 in. dia. 16 in. lg.			1	*	B-1	12
P	0		5110-241-8807	CUTTER, WIRE ROPE: 1 in. capacity			1	*	B-1	2
P	0		5120-754-0840	DRIFT: Steel, round 3/4 in. dia., 10 in. lg.			1	*	B-1	13
P	0		4930-253-2478	GREASE GUN: Hand lever operated, 16 oz. capacity.			1	*	B-1	20
P	0		5120-224-4046	HAMMER, HAND: Machinist's ball-peen, 1 1/4 lb. head.			1	*	B-1	14
P	0		5120-251-4489	HAMMER, HAND: Blacksmith's sledge, double face, 8 lb. head.			1	*	B-1	16
P	0		4930-360-3264	HOSE ASSEMBLY: Grease gun, hydraulic coupling one end, other end male connection.			1	*	B-1	27
P	0		4930-169-8275	OILER, HAND: 16 oz. capacity, force fed by internal pump			1	*	B-1	4
P	0		5120-223-7397	PLIERS, SLIP-JOINT: Straight nose type, with cutter, 8 in. lg.			1	*	B-1	3
P	0			SCREWDRIVER, FLAT TIP: Flared tip, 1/4 in. w., 4 in. lg. blade			1	*	B-1	18
P	0		5120-236-2092	SCREWDRIVER, FLAT TIP: 7/16 in. nom w/flared tip, 10 in. lg. blade			1	*	B-1	17
P	0		5120-240-5328	WRENCH, OPEN END, ADJUSTABLE: 8 in. nom lg. overall			1	*	B-1	24
P	0		5120-264-3796	WRENCH, OPEN END, ADJUSTABLE: 12 in. lg. nom overall			1	*	B-1	23
P	0		5120-423-6728	WRENCH, OPEN END, ADJUSTABLE: 15 in. lg. nom overall			1	*	B-1	22

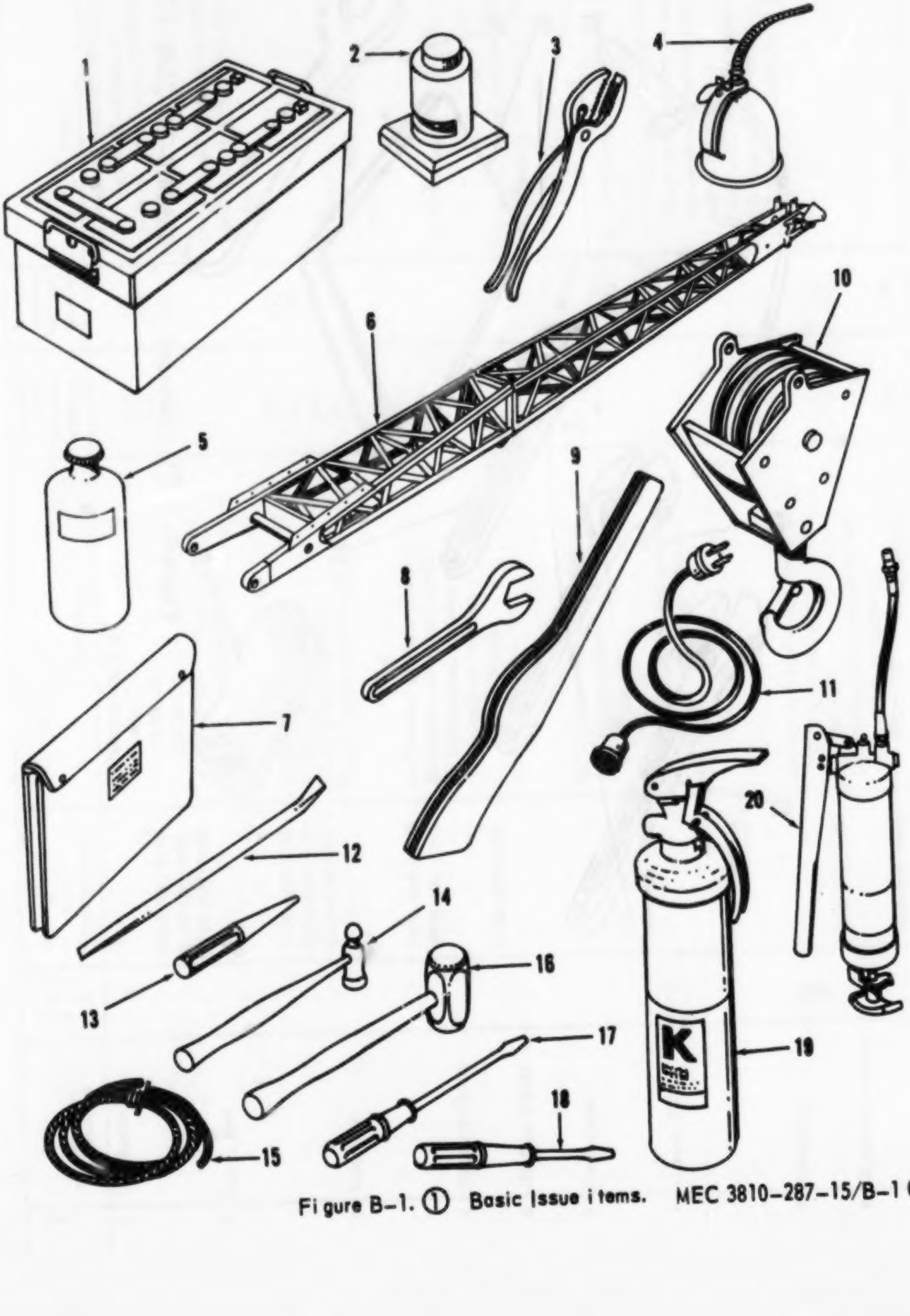

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
K

Figure B-1. ① Basic Issue items. MEC 3810-287-15/B-1 ①

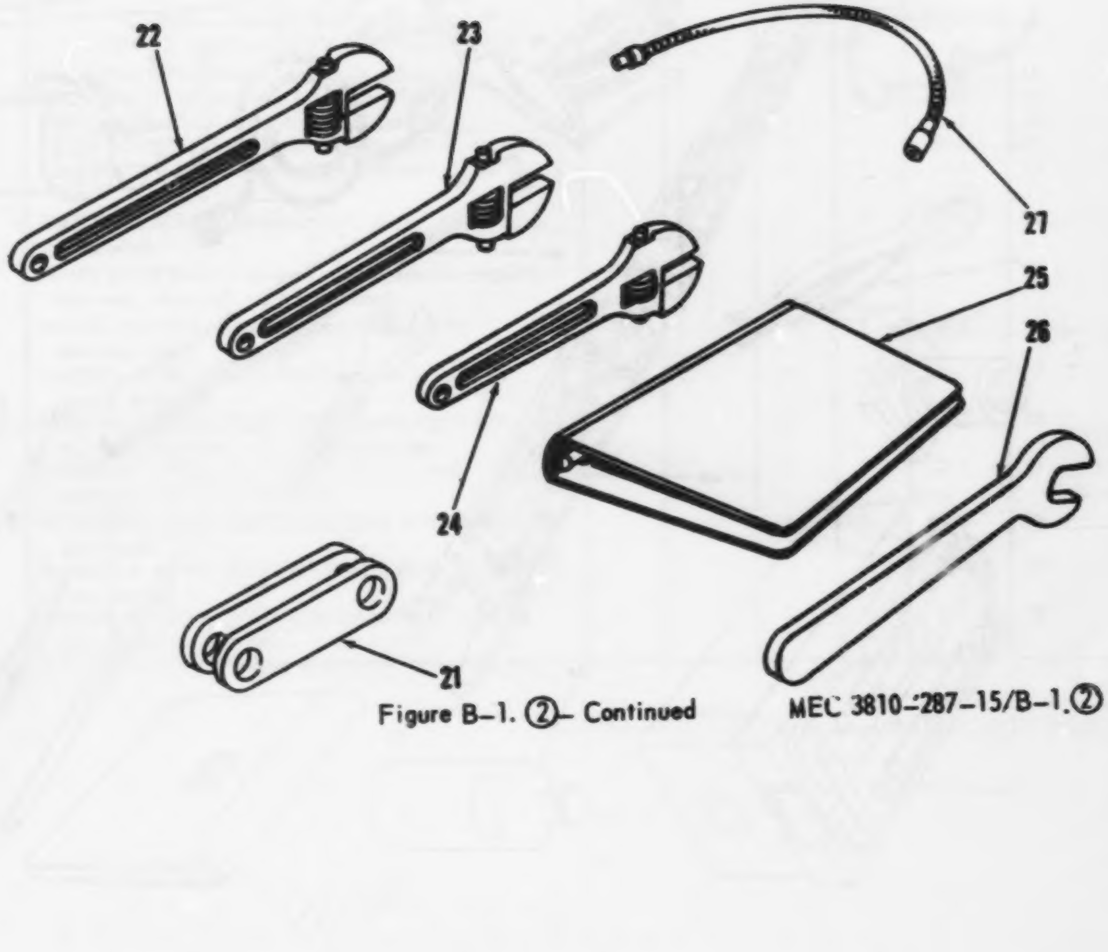

22
23
27
25
26
24
21

Figure B–1. ②– Continued

MEC 3810-287-15/B-1.②

Section III. MAINTENANCE AND OPERATING SUPPLIES

Item	Component application	Source of supply	Federal stock number	Description	Quantity required for initial operation	Quantity required for 8 hrs. operation	Notes
1	Crankcase			Oil lubricating 5 gal. drums as follows:			(1) Includes quantity of oil to fill engine oil system as follows: Crankcase, w/filters 10 qt. (2) See C-9100-IL for additional data and requisitioning procedures. (3) See LO 5-3810-287-15 for grade, application and replenishment. (4) Tank capacity: 50 gal. (5) Average fuel consumption is 6 gallons per hour of continuous operation. (6) Cooling system capacity is 25 qts. (7) Maximum protection is obtained at 60 percent by volume (4.8 pints of ethylene glycol per gallon of solution). (8) Do no dilute with water or any other substance. (9) Reservoir capacity—10 gal.
			9150-265-9435	OE30 (2)	(1)	(3)	
			9150-265-9423	OE10 (2)	(1)	(3)	
			9150-242-7603	OES (2)	(1)	(3)	
2	Tank, fuel			Fuel Oil, Diesel, Bulk (2)			
			9140-286-5294	Regular grade (DF-2)	(4)	(5)	
			9140-286-5286	Winter grade (DF-1)	(4)	(5)	
			9140-286-5283	Arctic grade (DF-A)	(4)	(5)	
3	Radiator			Water, Antifreeze 55 gallon drum	(6)		
			6850-[illegible]	Antifreeze, ethylene glycol	(7)		
			6850-174-1806	Antifreeze, compound arctic	(8)		
4	Exposed Gears			Oil lubricating, exposed gear: 5 lb. pail as follows:			
			9150-234-5199	CW-11-B (2)	lb.	(3)	
5	Oil Can Points			Oil Lubricating		(3)	
6	Gear Case			Oil Lubricating Gear: 5 gal. drum as follows:			
			9150-577-5844	GO 90 (2)		(3)	
			9150-257-5440	GOS (2)		(3)	
7	Grease Points			Grease, automotive and artillery, 5 lb. can as follows:			
			9150-190-0905	GAA (2)	lb.	(3)	
8	Shearball			Grease, ball and roller bearing, 35 lb. pail as follows:			
			9150-249-0908	BR (2)	lb.	(3)	
9	Hydraulic system			Hydraulic fluid, petroleum, 55 gal. drum as follows:			
			9150-265-9408	OHA (2)	(9)	(3)	

APPENDIX C

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

C-1. General

a. Section I provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance operations on the identified end item or component. The implementation of the maintenance tasks upon the end item or component will be consistent with the assigned maintenance operations.

c. Section III lists the special tools and test equipment required for each maintenance operation as referenced from section II.

d. Section IV contains instructions, explanatory notes and/or illustrations required for a particular maintenance function.

C-2. Explanation of Columns in Section II

a. Functional Group Number. The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TB 750-93-1 Functional Grouping Codes) are listed on the Maintenance assignment in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. Component Assembly Nomenclature. This column contains a brief description of the components of each functional group.

c. Maintenance Operations and Maintenance Levels. This column lists the various maintenance operations (A through J) and indicates the lowest maintenance level authorized to perform these operations. The symbol designation for the various maintenance levels are as follows:

C — Operator or crew
O — Organizational
F — Direct support
H — General support
D — Depot

The Maintenance Operations are defined as follows:

A—SERVICE: Operations required periodically to keep the item in proper operating condition, i.e., to clean, preserve, drain, paint and replenish fuel, lubricants, hydraulic and deicing fluids, or compressed air supplies.

B—ADJUST: Regulate periodically to prevent malfunction. Adjustments will be made commensurate with adjustment procedures and associated equipment specifications.

C—ALINE: Adjust two or more components of an electrical or mechanical system so that their functions are properly synchronized or adjusted.

D—CALIBRATE: Determine, check or rectify the graduation of an instrument, weapon, or weapons system or components of a weapons system.

E—INSPECT: Verify serviceability and detect incipient electrical or mechanical failure by close visual examination.

F—TEST: Verify serviceability and detect incipient electrical or mechanical failure by measuring the mechanical or electrical characteristics of the item and comparing those characteristics with authorized standards. Tests will be made commensurate with test procedures and with calibrated tools and/or test equipment referenced in the MAC.

G—REPLACE: Substitute serviceable components, assemblies and subassemblies for unserviceable counterparts or remove and install the same item when required for the performance of other maintenance operations.

H—REPAIR: Restore to a serviceable condition by replacing unserviceable parts or by any other action required using available tools, equipment and skills—to include welding, grinding, riveting, straightening, adjusting and facing.

I—OVERHAUL; Restore an item to a completely serviceable condition (as prescribed by serviceability standards developed and published by the commodity commands) by employing techniques of "Inspect and Repair Only as use of diagnostic and test equipment is combined with minimum disassembly during overhaul. "Overhaul" may be assigned to any level of maintenance except organizational, provided the time, tools, equipment, repair parts authorization and technical skills are available at that level. Normally, overhaul as applied to end items, is listed to depot maintenance level.

J—REBUILD: Restore to a condition comparable to new by disassembling to determine the condition of each component part and reassembling using serviceable, rebuilt or new assemblies, subassemblies and parts.

d. Reference Note. This column, subdivided into columns K and L is provided for referencing the Special Tool and Test Equipment Requirements (sec. III) and Remarks (sec. IV) that may be associated with maintenance operations (sec. II).

C-3. Explanation of Columns in Section III

a. Reference Code. This column consists of a number and a letter separated by a dash. The number references the T & TE requirements column on the MAC. The letter represents the specific maintenance operation the item is to be used with. The letter is representative of columns A through J on the MAC.

b. Maintenance Level. This column shows the lowest level of maintenance authorized to use the special tool or test equipment.

c. Nomenclature. This column lists the name or identification of the tool or test equipment.

d. Tool Number. This column lists the manufacturer's code and part number, or Federal stock number, of tools and test equipment.

C-4. Explanation of Columns in Section IV

a. Reference Code. This column consists of two letters separated by a dash, both of which are references to section II. The first letter references Column L and the second letter references a maintenance operation, Column A through J.

b. Remarks. This column lists information pertinent to the Maintenance Operation being performed, as indicated on the Maintenance assignment section II.

Section II. MAINTENANCE ASSIGNMENT

Functional Group No.	Component assembly nomenclature	Maintenance operations									Maintenance levels			Note Ref
			A	B	C	D	E	F	G	H	I	J	K	L
		Essentiality	Service	Adjust	Aline	Calibrate	Inspect	Test	Replace	Repair	Overhaul	Rebuild	T&TE rqmt	Remarks
01	**ENGINE**													
0100	Engine Assembly	--	C	--	--	--	C	F	F	F	H	D	--	A
0101	Crankcase, block, cylinder head													
	block, cylinder; crankcase	--	--	--	--	--	--	--	H	H				
	Head, cylinder	--	--	--	--	--	--	--	F	F				
0102	Crankshaft:													
	Crankshaft assembly; bearings; seals	--	--	--	--	--	--	--	H	--	--	D	--	B
	Damper and pulley	--	--	--	--	--	--	--	F					
0103	Flywheel Assembly	--	--	--	--	--	--	--	F	F				
0104	Pistons, Connecting Rods	--	--	--	--	--	--	--	H	H				
0105	Valves, Camshafts, and Timing Systems:													
	Arm assembly rocker	--	--	O	--	--	--	--	F	F				
	Bushings, camshaft, gears	--	--	--	--	--	--	--	H					
	Cover, valve	--	--	--	--	--	--	--	O					
	Push rods, springs, guides locks, valves and seats	--	--	--	--	--	--	--	F					
0106	Engine Lubrication System:													
	Cooler, oil	--	--	--	--	--	--	--	O	O				
	Filter, assembly, oil	--	C	--	--	--	--	--	O	O				
	Lines; pan, oil	--	--	--	--	--	--	--	F					
	Pump, oil	--	--	--	--	--	--	--	F	F				
	Valve, by-pass	--	--	--	--	--	--	--	O					
	Regulator, oil pressure	--	--	--	--	--	--	--	F	F				
0108	Manifolds	--	--	--	--	--	--	--	O					
0109	Accessory Driving Mechanism	--	--	--	--	--	--	--	F					
02	**CLUTCH**													
0200	Clutch Assembly	--	C	C	--	--	C	--	F	F	F			
0202	Clutch Release Mechanism:													
	Bearing	--	--	--	--	--	--	--	F					
	Rods, Levers	--	--	C	--	--	--	--	O					
03	**FUEL SYSTEM**													
0301	Fuel Injector	E	--	O	--	--	--	F	F	F				
0302	Fuel Pump	--	O	F	--	--	--	H	F	F	H	D	--	C
0304	Air Cleaner	--	C	--	--	--	--	--	O					
0305	Blower Assembly	--	--	--	--	--	--	--	F	F	H			
	Drive Assembly, Blower	--	--	--	--	--	--	--	F	F	H			
0306	Tank; Lines; Fittings:													
	Lines; fittings; valve, shut-off	--	--	--	--	--	--	--	O					
	Strainer; cap, tank	--	C	--	--	--	--	--	O					
	Tank, fuel	--	--	--	--	--	C	--	O	F				
0308	Engine Speed Governor	--	--	O	--	--	--	--	O	F	H			
0309	Fuel Filters	--	O	--	--	--	--	--	O	--	--	--	--	D
0311	Engine Starting Aids:													
	Puncturing tool assembly	--	C	--	--	--	--	--	O					
	Primer unit; lines; fittings	--	--	--	--	--	--	--	O	F				
0312	Throttle Control	--	--	O	--	--	--	--	O					

Functional Group No.	Component assembly nomenclature	Maintenance operations									Maintenance levels			Note Ref
			A	B	C	D	E	F	G	H	I	J	K	L
		Essentiality	Service	Adjust	Aline	Calibrate	Inspect	Test	Replace	Repair	Overhaul	Rebuild	T&TE rqmt	Remarks
04	EXHAUST SYSTEM													
0401	Muffler and Pipes	--	--	--	--	--	--	--	O					
05	COOLING SYSTEM													
0501	Radiator	--	C	--	--	--	C	O	O	F				
	Cap	--	--	--	--	--	--	--	O					
0502	Shroud	--	--	--	--	--	--	--	O	O				
0503	Water Manifold, Thermostats and Housing Gasket	--	--	--	--	--	--	--	O					
0504	Water Pump	--	--	--	--	--	--	--	F	F	H			
0505	Fan Assembly	--	O	--	--	--	--	--	O	F				
	Belt, fan	E	--	C	--	--	C	--	O					
06	ELECTRICAL SYSTEM													
0601	Alternator:													
	Alternator assembly	--	C	--	--	--	--	O	O	F	--	--	--	E
	Pulley	--	--	--	--	--	--	--	O					
	Belts	E	--	C	--	--	C	--	O					
0603	Starting Motor:													
	Motor, starting	--	C	--	--	--	--	O	O	F	--	--	--	E
	Solenoid	--	--	--	--	--	--	O	O					
0606	Engine Safety Controls:													
	Governor, overspeed	--	--	O	--	--	--	--	O	F				
	Switch	--	--	--	--	--	--	--	O					
0607	Instrument or Engine Control Panel													
	Switches; gages; meters; lights, panel	--	--	--	--	--	--	--	O					
	Lamps, fuses	--	--	--	--	--	--	--	O					
	Wiring harness	--	--	--	--	--	--	--	F	O				
0609	Lights:													
	Floodlights	--	--	--	--	--	--	--	O					
	Lamp, floodlight	--	--	--	--	--	--	--	O					
0610	Sending Units and Warning Switches	--	--	--	--	--	--	--	O					
0611	Horn	--	--	--	--	--	--	--	O					
0612	Batteries, Storage:													
	Batteries	--	C	--	--	--	C	O	O					
	Box, Battery; Cables, Battery	--	C	--	--	--	C	--	O	O				
0613	Hull or Chassis Wiring Harness	--	--	--	--	--	--	--	F	O				
0615	Radio Interference Suppression	--	--	--	--	--	--	O	O					
07	TRANSMISSION													
0700	Transmission Assembly, and Shafts	--	C	--	--	--	C	O	F	F	H			
0704	Transmission Top Cover	--	--	--	--	--	--	--	F	F				
	Breather	--	C	--	--	--	--	--	O					
13	WHEELS AND TRACKS													
1301	Suspension Assembly	--	--	--	--	--	O	--	H	F				
1302	Track Support Rollers and Brackets	--	C	--	--	--	C	--	O	F				
1303	Track Idlers and Brackets	--	C	--	--	--	C	--	F	F				
1304	Track Drive Sprockets:													
	Sprockets	--	--	--	--	--	--	--	F					
	Chain, roller	--	--	O	--	--	--	--	O	O				
1305	Track Assembly	--	--	C	--	--	C	--	F	O				

Functional Group No.	Component assembly nomenclature	Maintenance operations									Maintenance levels			Note Ref
			A	B	C	D	E	F	G	H	I	J	K	L
		Essentiality	Service	Adjust	Aline	Calibrate	Inspect	Test	Replace	Repair	Overhaul	Rebuild	T&TE rqmt	Remarks
15	FRAME													
1502	Counterweights	--	--	--	--	--	--	--	F					
18	BODY, CAB, HOOD AND HULL													
1801	Body, Cab, Hood and Hull Assemblies													
	Doors, guides, glass, panels, platform	--	--	--	--	--	C	--	O					
1806	Upholstery Seats and Carpets:													
	Seat assembly	--	--	C	--	--	--	--	O	O				
22	BODY CHASSIS OR HULL, AND ACCESSORY ITEMS													
2210	Data Plates and Instruction Holders													
	Data plates	--	--	--	--	--	--	--	F					
	Caution, instruction plates and instruction holders	--	--	--	--	--	--	--	O					
43	HYDRAULIC, FLUID, AIR AND VACUUM SYSTEM													
4301	Hose; Tubing; Rotating Joint:													
	Upper works	--	--	--	--	--	--	--	O					
	Joint; center journal rotating	--	--	--	--	--	O	--	F					
4306	Control Valves	--	--	--	--	--	--	--	O	O				
4307	Hydraulic Cylinders	--	--	--	--	--	--	--	O	O				
47	GAGES (non-electrical)													
4701	Instruments	--	--	--	--	--	--	--	O					
4702	Gages, Mountings, Lines and Fittings	--	--	--	--	--	--	--	O					
4708	Hourmeter	--	--	--	--	--	--	--	O					
74	CRANES, SHOVELS AND EARTH MOVING EQUIPMENT COMPONENTS													
7402	Drum, Third	C	O	--	--	--	O	O	O	F	H			
7411	Crane Attachments:													
	Boom assembly; sheaves; hook, block; bridle assembly	--	C	--	--	--	C	--	O	O				
	Cables	--	--	C	--	--	--	--	O					
	Safety boom stop	--	--	--	--	--	--	--	O	O				
	Pulleys, pins and bushings	--	--	--	--	--	--	--	O					
7414	Base Deck:													
	Upper structure assembly	--	C	--	--	--	C	--	H	F	D			
	Revolving base	--	C	--	--	--	C	--	D	F				
7415	Clutches, Brakes	--	C	C	--	--	C	--	O	O	H			
7416	Shafts:													
	Chain, drive	--	--	O	--	--	--	--	O	O				
	Sprockets, gears, bearings	--	--	--	--	--	--	--	F					
	Case assembly, chain	--	C	--	--	--	C	--	O	F				
	Coupling, shaft; shaft assemblies	--	C	--	--	--	C	--	H	H				
7417	Hoists:													
	Hoist assemblies	--	C	--	--	--	C	--	F	H				
	Guards, shields	--	--	--	--	--	--	--	O					

Functional Group No.	Component assembly nomenclature	Maintenance operations							Maintenance levels					Note Ref
			A	B	C	D	E	F	G	H	I	J	K	L
		Essentiality	Service	Adjust	Aline	Calibrate	Inspect	Test	Replace	Repair	Overhaul	Rebuild	T&TE reqmt	Remarks
7419	Turntable:													
	Bushing, pivot	--	C	--	--	--	--	--	H					
	Rollers	--	C	--	--	--	--	--	O	F				
	Swing lock	--	C	--	--	--	--	--	O	O				
7420	Machinery Gear Case or Frame:													
	Breathers	--	C	--	--	--	--	--	O					
	Covers; guards; pan assembly, oil	--	--	--	--	--	--	--	O	O				
7421	Independent or Precision Boom Hoist	--	C	--	--	--	C	--	F	K				
7422	Machinery Mechanism Controls	--	C	C	--	--	C	--	O					
7423	Gantry:													
	Frame, gantry	--	--	--	--	--	C	--	F	O				
	Bushing; roller; shaft	--	C	--	--	--	--	--	F					
	Sheave assembly	--	C	--	--	--	--	--	O					
7424	Crawler Bed, Frame and Ring Gear:													
	Rack and track	--	C	--	--	--	--	--	H	D				
	Gear, ring; bearings	--	--	--	--	--	--	--	H					
7425	Propel and Steering Mechanism:													
	Bearings, gears, seals	--	--	--	--	--	--	--	H					
76	FIRE FIGHTING EQUIPMENT COMPONENTS													
7603	Fire Extinguisher	--	--	--	--	--	C	--	O					

Section III. SPECIAL TOOL AND SPECIAL TEST EQUIPMENT REQUIREMENTS

Reference code	Maintenance level	Nomenclature	Tool number
		No Special tools or test equipment required to perform maintenance on the crane. Add track and clutch and brake wrenches.	

Section IV. REMARKS

Reference code	Remarks
A–F	Test includes engine operation and compression.
B–J	Metalize, Grind and Resize.
C–F	Test includes bench test.
D–A	Replace filter element.
E–H	Install repair kit.

INDEX

	Paragraph	Page
Air cleaner	3-35	3-59
Air inlet housing	6-7	6-4
Alternator	6-3	6-4
Alternator drive pulley	3-64	3-84
Alternator V-belt	3-62	3-82
Alternator V-belt adjustment	3-11	3-36
Ammeter	3-69	3-87
Backhoe attachment	2-11	2-14
Backhoe boom assembly	10-6	10-5
Backhoe bucket assembly	10-2	10-1
Backhoe handle and pitch brace assembly	10-4	10-3
Backhoe mast assembly	10-8	10-7
Balance weight cover	6-28	6-38
Basic issue tools and equipment	3-2	3-1
Batteries, battery box and cables	3-67	3-84
Battery-charging ammeter indicates low or no charging rate when batteries are low or discharged	3-35—5-13	3-56—5-2
Battery service	3-20	3-37
Bevel gear housing	7-16	7-19
Blower assembly	6-9	6-11
Blower drive assembly	6-8	6-11
Boom base assembly	9-4	9-4
Boom harness assembly	3-102—9-6	3-134—9-6
Boom harness and cables	2-6	2-3
Boom insert sections	2-7	2-8
Boom hoist brake slips	3-38—5-16	3-56—5-3
Boom point assembly	9-2	9-1
By-pass valves	3-78	3-96
Cab assembly	5-24—7-30	5-4—7-38
Cab panels	3-83	3-108
Camshaft and balance shaft	6-24	6-30
Center journal rotating joint	8-8	8-9
Center travel shaft and bevel gear assembly	8-16	8-19
Chain case assembly	3-108	3-142
Chassis wiring	3-68	3-85
Clamshell bucket installation	2-10	2-13
Clutch release rods and levers	3-81	3-105
Clutch shaft assembly	3-12	3-36
Clutch shaft assembly (left hand)	7-11	7-13
Clutch shaft assembly (right hand)	7-10	7-12
Clutch shaft clutches	3-98	3-128
Clutch shaft clutch adjustment	3-13	3-37
Clutch shaft clutch shoe assemblies	7-12	7-16
Cold weather starting aid assembly	3-51	3-59
Cold weather starting aid service	3-18	3-37
Controls and instruments	2-17	2-18
Control levers	3-82	3-106
Control valve (crawler)	3-95	3-121
Cooling system service	3-19	3-37

	Paragraph	Page
Counterweight assembly	7-32	7-42
Crane boom sheaves	3-101	3-133
Crankshaft assembly	6-22	6-37
Crankshaft pulley and front cover	6-17	6-30
Crawler belt adjustment	3-22	3-37
Crawler belt assemblies	3-107—8-2	3-141—8-1
Crawler belts jump drive sprockets	3-40—5-18	3-56—5-3
Crawler does not steer straight	3-41—5-19	3-56—5-3
Crawler drive assembly	8-4	8-1
Crawler drive chains	3-106—8-3	3-141—8-1
Crawler drive chain adjustment	3-21	3-37
Crawler frame	8-17	8-21
Crawler frame assembly	5-35	5-14
Crawler jaw clutch cylinders	8-10	8-9
Crawler operating levers and linkage	8-9	8-9
Crawler steering cylinder	3-94	3-120
Cylinder head assembly	6-14	6-29
Cylinder liners	6-25	6-39
Daily preventive maintenance services	3-6	3-28
Deck gears	7-19	7-25
Detailed lubrication instructions	3-4	3-1
Difference in models	1-5	1-6
Dipper assembly	11-2	11-1
Dipper handle assembly	11-4	11-3
Dipper trip assembly	11-10	11-9
Dismantling for movement	2-14	2-17
Doors	3-84	3-108
Dragline bucket	2-9	2-13
Drive chains	3-108	3-135
Engine assembly	5-26	5-4
Engine block	6-27	6-44
Engine clutch adjustment	3-16	3-37
Engine clutch assembly	6-28	6-46
Engine clutch release mechanism adjustment	3-17	3-37
Engine drive chain assembly	3-109	3-144
Engine exhaust smoke excessive	3-33—5-11	3-55—5-2
Engine hard to start or fails to start	3-26—5-4	3-54—5-1
Engine has low or no oil pressure	3-32—5-9	3-55—5-2
Engine knocks or develops sudden noise	3-30—5-8	3-55—5-2
Engine lacks power	3-29—5-7	3-55—5-1
Engine oil consumption high	3-32—5-10	3-55—5-2
Engine overheats	3-27—5-5	3-54—5-1
Engine runs too cold	3-28—5-6	3-55—5-1
Engine transmission	5-25	5-4
Exhaust manifold	3-80	3-101
Exhaust valve rocker arm assembly	3-48	3-59
Fan assembly	6-10	6-12
Fan blade	3-60	3-76
Fan V-belt	3-61	3-76
Fan V-belt adjustment	3-10	3-36
Fire extinguisher	2-28	2-31
Floodlights	3-74	3-88
Flywheel assembly	6-16	6-29
Flywheel housing assembly	6-16	6-29
Front idler rollers	8-5	8-2
Fuel filter service	3-9	3-36
Fuel filters	3-54	3-60

	Paragraph	Page
Fuel gage	3-70	3-87
Fuel injectors	6-5	6-4
Fuel pump	6-4	6-4
Fuel tank, lines and fittings	3-55	3-62
Gantry shaft assembly	7-22	7-28
Gantry sheaves and shaft	3-105	3-140
General lubrication information	3-3	3-1
General methods used to attain proper suppression	3-43	3-56
Glass	3-85	3-110
Governor	3-50	3-59
Governor assembly	6-11	6-13
Guards and shields	3-104	3-136
Hoist and boom hoist brakes	7-3	7-1
Hoist, boom hoist and third drum brakes	3-100	3-132
Hoist, boom hoist and third drum brake adjustment	3-15	3-37
Hoist brakes will not hold load	3-36—5-14	3-55—5-2
Hoist clutches will not raise load	3-35—5-15	3-55—5-3
Hoist shaft assembly	5-31—7-2	5-4—7-1
Hook block assembly	9-8	9-7
Horn	3-75	3-89
Houselock cylinder	3-96	3-121
Hydraulic lines and fittings (controls)	3-92	3-118
Hydraulic reservoir (controls)	3-91	3-116
Hydraulic reservoir (main)	3-97	3-121
Identification and tabulated data	1-4	1-2
Injector rocker arm assembly	3-49	3-59
Inspect and servicing equipment	2-3	2-1
Installation of separately packed components	2-4	2-1
Installation or setting-up instructions	2-5	2-1
Instruction holders	3-88	3-114
Instruction plates	3-87	3-114
Interference suppression components	3-44—5-21	3-56—5-3
Master cylinders	3-89	3-116
Master cylinder service	3-24	3-37
Muffler and exhaust pipe	3-79	3-101
Oil cooler assembly	3-76	3-96
Oil filter assembly	3-77	3-98
Oil pan assembly	6-18	6-31
Oil pressure gage	3-72	3-88
Oil pressure regulator	6-20	6-34
Oil pump assembly	6-19	6-31
Operation at high altitude	2-27	2-26
Operation in dusty or sandy areas	2-24	2-25
Operation in extreme cold (below 0°F)	2-22	2-22
Operation in extreme heat	2-23	2-22
Operation in salt water areas	2-26	2-26
Operation under rainy or humid conditions	2-25	2-25
Operation under usual conditions	2-21	2-22
Outer shafts and sprockets	8-15	8-19
Pistons, pins and connecting rods	6-21	6-34
Power boom lowering assembly	5-27—7-5	5-4—7-6
Power boom lowering and power load lowering clutch adjustment	3-14	3-37
Power load lowering assembly	5-28—7-7	5-4—7-8
Power load lowering and power boom lowering clutches	3-99	3-129
Pump, hose, lines and fittings	3-93	3-120
Quarterly preventive maintenance services	3-7	3-28

	Paragraph	Page
Radiator	3–56	3–74
Radiator shroud	3–57	3–76
Radio interference suppression—definitions	3–40	3–56
Record and report forms	1–2—4–2	1–1—4–1
Reinstallation after movement	2–15	2–17
Replacement of suppression components	3–45—5–22	3–56—5–3
Reversing shaft assembly	5–29	5–4
Rocker arm cover	3–47	3–57
Rocker arm shaft assembly	6–13	6–25
Rotating joints	3–94	3–120
Scope	1–1—4–1	1–1—4–1
Seat assembly	3–86	3–111
Sending units and warning switches	3–73	3–88
Shear-Ball assembly	7–26	7–34
Shipper shaft assembly	11–6	11–6
Shovel boom assembly	11–8	11–7
Shovel front attachment	2–12	2–14
Slave cylinders	3–90	3–117
Specially designed tool and equipment	5–2	5–1
Special tools and equipment	3–1—5–1	3–1—5–1
Starter assembly	6–2	6–1
Starter fails to crank engine	3–34—5–12	3–55—5–2
Starting	2–19	2–22
Starting motor	3–65	3–84
Starting motor switch	3–66	3–84
Stopping	2–20	2–22
Swing and travel jaw clutch shift mechanism	7–18	7–22
Swing clutches slip	3–39—5–17	3–56—5–3
Tabulated data	4–4	4–1
Temperature gage	3–71	3–88
Testing of radio interference suppression components	3–46	3–56
Thermostat and housing	3–59	3–76
Third drum assembly	5–30—7–24	5–4—7–31
Throttle controls	3–52	3–59
Timing gears	6–26	6–42
Transmission assembly	6–29	6–47
Transmission breather service	3–23	3–37
Turntable bed	5–32—7–28	5–6—7–37
Unloading equipment	2–1	2–1
Unpacking equipment	2–2	2–1
Upper and lower rollers	8–6	8–3
Vertical reversing shaft assembly	7–14	7–17
Vertical swing shaft assembly	5–33—7–20	5–6—7–26
Vertical travel shaft assembly	8–12	8–17
Water manifold	3–58	3–76
Water pump assembly	6–6	6–11

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:

KENNETH G, WICKHAM.
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

USASA (2)
ACSI (1)
DCSLOG (1)
CNGB (1)
TSG (1)
CofEngrs (3)
CC-E (1)
Dir of Trans (1)
CofSptS (1)
USAMB (1)
USA Arty Bd (2)
USA Armor Bd (2)
USAIB (2)
USARADBD (2)
USAAESWBD (2)
USAAVNTBD (2)
USCONARC (3)
OS Maj Comd (5) except
  USARJ (1)
USASETAF (2)
USAMC (1)
USACDCEC (10)
USAMECOM (46)
MDW (1)
Armies (2)
Corps (2)
USAC (1)
Div (2)
Engr Bde (1)
USMA (2)
Br Svc Sch (2) except
  USAES (3)
Svc Colleges (2)
Gen Dep (10)
Engr Dep (10)
Army Dep (2) except
  TOAD (3)
USA Tml Comd (2)
Army Tml (1)
Div Engr (2)
Engr Dist (2)
Engr Cen (5)
USA Engr R&D Lab (3)
Engr FLDMS (2)
Ft Knox FLDMS (10)
AMS (3)
MAAG (1)
JBUSMC (1)
Army Attaches (1)
Mil Msn (1)
USACOMZEUR (2)
Fld Comd, DASA (8)
USAREUR Engr Proc Cen (2)
USAREUR Engr Sup Con Agcy (10)
Units org under fol TOE:
  5-48 (2)
  5-237 (5)
  5-262 (5)
  5-267 (1)
  5-278 (6)
  5-279 (2)

NG: None.

USAR: Same as Active Army except allowance is one (1) copy each.

For explanation of abbreviations used, see AR 320-50.

☆ U. S. GOVERNMENT PRINTING OFFICE : 1990 O - 261-872 (20817)